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SMARTPHONE MEDIATED BEHAVIORAL CHANGE TOWADS SUSTAINABLE LIFESTYLE

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ABSTRACT

The goal of this thesis is to support individuals in pursuing a sustainable lifestyle by creating a product, capable of changing users' behaviors and habits in their everyday life. Thus, the designed product is based on behavioral change design tailored to the existing user's aspirations towards a sustainable lifestyle. The product is channeled via globally used smartphone technology as mobile application called OURS, having service-dominant logic in its core, mediating access to various services and information in a scale of a neighborhood.

To achieve this goal this thesis synthesizes recent science-based narratives on what determines sustainable lifestyles and how they could be embraced by an individual. Moreover, it identifies current challenges and opportunities regarding the COVID-19 world-wide crises, bottom-up approach for change and the Platform Economy.

KEY WORDS

sustainable lifestyle | behavior change | behavioral models | aspiration | product design

ABSTRACTO

El objetivo de esta tesis es apoyar a individuos particulares en su búsqueda de un estilo de vida más sostenible a través de la creación de un producto con la capacidad de cambiar los comportamientos y hábitos de los usuarios en su vida cotidiana.
Así, el producto diseñado está basado en el diseño de cambio de comportamiento y está personalizado a las actuales aspiraciones del usuario hacia un estilo de vida sostenible. El producto está canalizado a través de la mundialmente utilizada tecnología del smartphone en forma de una aplicación llamada OURS, teniendo una lógica que prioriza el servicio desde su núcleo, mediando el acceso a diversos servicios e información en una escala de vecindario.

Para conseguir este objetivo, esta tesis sintetiza las más recientes narrativas con fundamento científico que explican qué determina los estilos de vida sostenibles y cómo pueden ser alcanzados por un individuo particular. Además, identifica los desafíos actuales y las oportunidades relacionadas con la crisis mundial provocada por la COVID-19, siguiendo un enfoque desde la base para el cambio y la Platform Economy.

PALABRAS CLAVE
estilo de vida sostenible | cambio de comportamiento | modelos de comportamiento | aspiración | diseño de producto

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“OUR LIFESTYLES ARE AT THE CENTRE OF OUR SUSTAINABLE FUTURE”

(Backhaus, Breukers, Mont, Paukovis, & Mourik, 2012, p. 6)

INTRODUCTION

Lifestyle is a driver of people's behaviors and decisions on how well-being and happiness is pursuit. It tremendously affects everything from the economy growth to the health of the environment and society, and it plays an important role in sustainable development. Suitable lifestyle specifically ensures that everything people do, have, use and display meet their needs and improves their quality of life while minimizing the consumption of natural resources, emissions, waste, and pollution and ensures that resources are protected for the generations to come.

To support individuals in pursuing behaviors and habits towards a sustainable lifestyle is the overall goal of this thesis. The thesis is divided into two parts, theoretical and practical-design part. The theoretical part focuses on the literature review of a sustainable lifestyle, behavioral change design, and the role of technology. In the practical part, a product with the goal to mediates behavioral change towards a sustainable lifestyle, is designed.

Based on the review of the literature a sustainable lifestyle was identified as a long-term ambition related to a wide range of areas of life. The results of this lifestyle are far in future, thus the motivation to pursue it is insufficient. Moreover, the unified, easy to understand instructions on how to behave in order to lead this type of lifestyle does not exist. These problems are firstly tackled in this thesis by dividing a sustainable lifestyle into five areas and identifying a set of aspirations a person could have. Secondly, because lifestyles are primarily manifested in individual behaviors, the list of behaviors towards sustainable lifestyle per aspiration was drawn from the literature. This concept was implemented to the product.

The designed product utilizes behavioral change design and it's mediated by smartphone technology in form of mobile application called **OURS**. The opportunity for product is perceived in the Platform Economy and service-dominant product, that helps to change behaviors of individuals within the community by improving access to information and services. In other words, the product encourages sustainable behaviors of individuals and households in their daily lives within community of neighbors, enabling them to understand, create and/or access the more sustainable lifestyle options.

OBJECTIVES AND RESEARCH QUESTIONS

1.1.1. Hypothesis

SMARTPHONE TECHNOLOGY CONTRIBUTES TO SUSTAINABLE DEVELOPMENT BY CHANGING BEHAVIORS AND HABITS OF INDIVIDUALS IN THEIR EVERYDAY LIFE, MEDIATING SUSTAINABLE LIFESTYLES GLOBALLY.

1.1.2.Overall goal

The goal of this thesis is to support individuals in pursuing behaviors and habits towards a sustainable lifestyle

- by designing service-dominant product focused on behavioral change tailored to users' aspirations
- channeled via the globally used smartphone technology
- within the framework of the Platform Economy.

1.1.3. Objectives

Theoretical part · Literature review

Objective 1: To identify recent science-based narratives on what determines sustainable lifestyles and what are related behaviors and habits of individuals.

Research Questions:

1.1 What is a sustainable lifestyle?

1.2 What are the behaviors and habits contributing to sustainable lifestyle?

Objective 2: To identify opportunities for change towards sustainable lifestyle from COVID-19 disruption of society

Research Questions:

2.1. What are the opportunities for change in lifestyle from the COVID-19 disruption?

Objective 3: To identify the most suitable behavioral models, strategies and tactics which could be used in designing digital product channeled via smartphone.

Research Questions:

3.1. What is behavioral change design?

3.2. What are the most suitable behavioral models that could be used in the digital product development process?

3.3. What is the role of technology in behavioral change design?

Practical part · Design project

Objective 4: Define a product that could be used by smartphone users to change their lifestyle towards sustainability

Research Questions:

3.1 How can be the sustainable lifestyle fostered on individual level in the immediate context (home, neighborhood, work) via smartphone technology?

3.2 What are the most common aspirations towards the sustainable lifestyle of a target audience?

1.2 Methodology

The most significant methodology used in this thesis is the literature review, which results are in a dedicated part Literature review. The goal of the methodology was to gain an understanding of a variety of topics that are crucial to designing a concept of a product that meets the goal of this thesis.

- The main resources of information on the topic of sustainable lifestyle used are the plans, agendas, and reports authorized by organizations such as the European Union and the United Nations.

- In order to identify the most suitable model for behavioral change that could be mediated by smartphones, the academic literature from diverse areas of science such as psychology, sociology, behavioral science, etc., was explored.

- Additionally, due to COVID-19 disruption of society, the available research on topics regarding opportunities towards behavioral change was reviewed from research done by the largest professional service networks that are having quick access to big data and customer research.

In the practical part of the thesis, several methods were used to design the solution.

- Quantitative research with 50 participants from the target audience was conducted in the form of an online survey during April 2020. The goal was to identify the most common aspirations among the target audience, the strategy behind the survey was based on Fogg behavioral model also used in the design of the solution. Participants were marking levels of motivation from 1 to 8 towards specific aspirations that were identified from the literature review as an aspiration towards a sustainable lifestyle. Aspirations were divided into 5 groups: food, housing, mobility, consuming, leisure. Participants were belonging to the target audience with the following characteristics: Independent middle-class, living in urban areas of Europe. The tools used were Forms for sharing the survey and Excel for analyzing collected data (see in Annex).

- In order to understand user needs for the solution, informal interviews were conducted remotely with 5 participants from the target audience during April 2020. The interviews were based on introductory question: *Why do you think that sustainable lifestyle is important?* Followed up by "5 whys technique" to identify the root cause of the fundamental-emotional human need or instinct. The tool used

was Messenger for video call and notebook for notes keeping and analyzing collected data.

- The effectiveness of the behavioral change design used in the product solution could be proved only by research done in a real-life scenario, using the real mobile application in real situations. This was not possible because the scope of the thesis covers only the concept of the product solution.

2. Theoretical part

LITERATURE REVIEW

This chapter represents a synthesis of the literature review divided into four segments with different topics. All segments were identified as a curtail theoretical background to proceed with product design.

- In the first segment, a sustainable lifestyle is explored and a list of areas, aspirations, and examples of specific behaviors contributing to this lifestyle are defined. The main sources of information are the plans, agendas, and reports authorized by organizations such as the European Union and the United Nations.

- The second segment is speculative and attempts to identify opportunities from COVID-19 disruption of society. The data are drawn from the research made by some of the largest professional service networks that are having quick access to big data and customer research.

- The third segment of the theoretical part is focused on behavioral change design introducing models and strategies that could be used in the practical/design part of the thesis with a focus on design practice used in the digital product development process. This segment is based on theory drawn from academic literature from diverse areas of science such as psychology, sociology, behavioral science, etc.

- The last segment of this chapter explores the role of the smartphone technology and its potentials in changing users' behaviors. Moreover, it explores the Platform Economy and the service-dominant product as an opportunity for the product strategy, which is explored later, in the practical part of this thesis.

2.1. Sustainable lifestyle

2.1.1. Sustainable lifestyle overview

In general, lifestyle refers to the way people live lives that allow them to fulfill their needs and aspirations. It affects how people prefer to live, where they live, where they go for vacation, where they shop and what they consume, how they spend their time, interact with others and define who these others are. Moreover, by reflecting world views, values and senses of self, lifestyle signal social position and aspirations to others. Importantly, lifestyle occurs within and is enabled and constrained by social norms and the physical environment (Backhaus, Breukers, Mont, Paukovis, & Mourik, 2012). People's lifestyle (including visions and aspirations in life) is not set in stone but changes as their personal situation evolves, as society evolves and as knowledge, norms, and technology change (UNEP, 2011). One type of lifestyle, which people might have or change towards, is a sustainable lifestyle, which is broadly discussed in this thesis as the desired goal of transformation fostered via behavioral change design.

However, there is no commonly agreed definition of a sustainable lifestyle, in this thesis sustainable lifestyle is seen as "a cluster of habits and patterns of behavior embedded in society and facilitated by institutions, norms, and infrastructures that frame individual choice, in order to minimize the use of natural resources and generation of wastes, while supporting fairness and prosperity for all." (Akenji & Chen, 2016, p. 3) In other words, sustainable lifestyle intent to ensure that everything people do, have, use and display meet their needs and improves their quality of life while minimizing the consumption of natural resources, emissions, waste, and pollution and ensures that resources are safeguarded for future generations (Backhaus, Breukers, Mont, Paukovis, & Mourik, 2012).

The factors, which are influencing sustainable lifestyle with focus on consumption, are divided to three groups: determinants (Attitude, Facilitators, Infrastructure), driving factors and motivating factors. An overview of these factors is provided in the diagram below Akenji & Chen, in 2016.

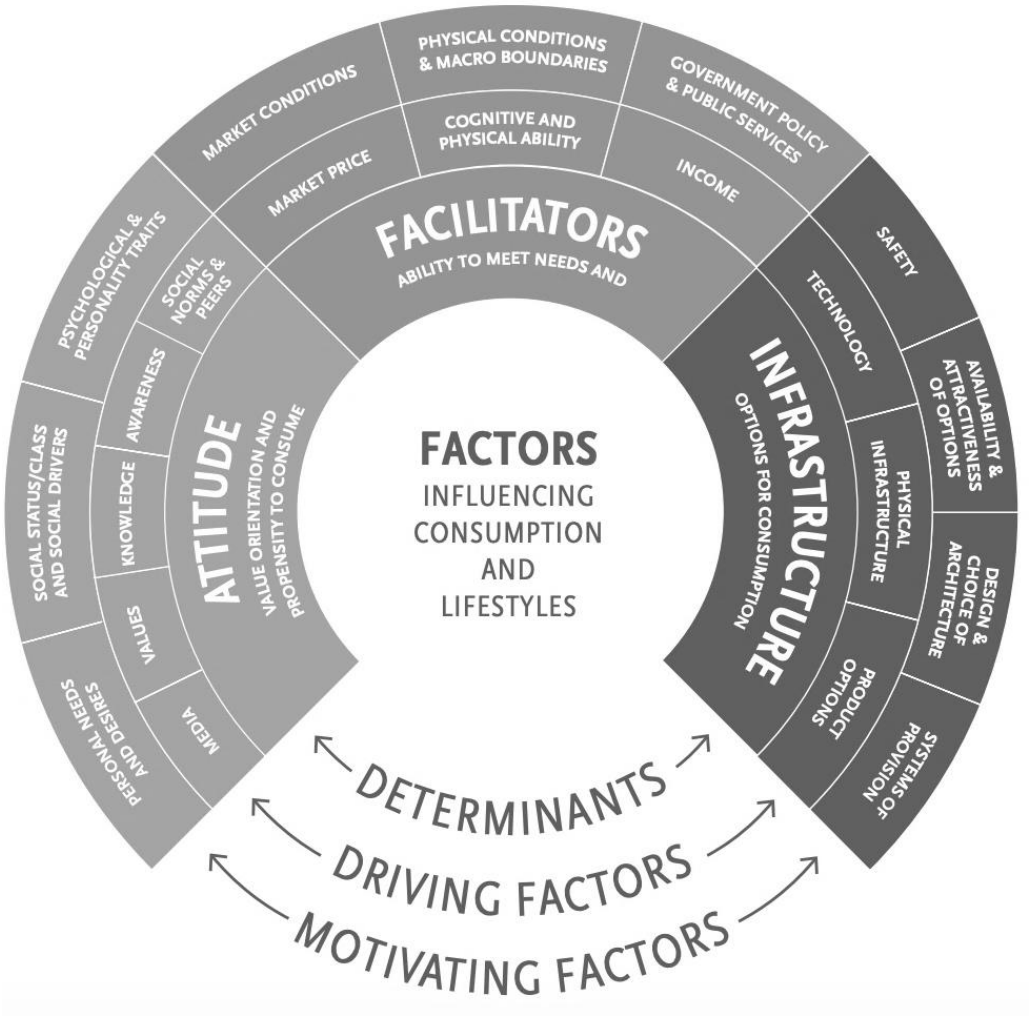

Figure 1: Factors influencing sustainable lifestyle *(Akenji & Chen, 2016)*

Listed factors are divided into three groups: determinants, driving factors and motivating factors. Determinates are the high-level factors such as attitudes, facilitators and infrastructure. A person can have influential power over them. The deeper look into driving factors could help to uncover factors that could be influenced and changed by user him/herself such as media (the person can select what sort of media he/she is following), knowledge (the person could invest to education and to specific topics), technology (the person can select a technology), etc. Motivating factors on the other hand could leverage in order to gradually change lifestyle towards sustainability.

Mentioned factors drive and reflect a specific cultural, natural, economic and social heritage of each society (Mont, 2007), thus universal guidance for a sustainable lifestyle

doesn't exist. Nevertheless, the recent international activities, supported by scientific studies, are encouraging individuals towards sustainable lifestyles, for instance by:

- The COP21 Paris Agreement (UNFCCC, 2015) made it clear that sustainable lifestyles and sustainable consumption and production are crucial in the fight against climate change.
- Paris Climate Change Agreement specifies a development goal 12.8 that sets the target: "By 2030 ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature." (United Nations, 2015) This goal specifically relates to Goal 12. "To ensure sustainable consumption and production patterns." (United Nations, 2015)

2.1.2. Structure of sustainable lifestyle

Based on A framework for shaping sustainable lifestyles, determinants, and strategies by UNEP (Akenji & Chen, 2016) the key lifestyle areas are identified as food, housing, mobility, consuming and leisure. Water, energy, and waste are addressed as cross-cutting elements that affect and are affected by almost every lifestyle domain. This division of sustainable lifestyle was selected because it highlights that sustainable lifestyles imply beyond just environmental impacts, also to the social and economic dimensions of sustainable development. The areas are in this thesis furthermore divided into aspirations with a set of behaviors. Moreover, this structure of a sustainable lifestyle is used in the design process of behavioral change towards a sustainable lifestyle of individuals and mirrored to product itself.

Areas

1. Food

Not only what people eat and drink, but also how it is produced (land use, land fragmentation, farming practices, energy, water, and pesticide use), processed (packaging materials) and what happens after the usage (waste recycling) impacts the environment, economy, and society.

For a behavioral change, it is important to identify the most typical factors in people's decisions related to food. They could be objective and subjective factors such as cost, freshness, health impacts, marketing, availability, place of origin, taste, and culture.

2. Housing

Where and how people live affect all aspects of sustainable development, for instance energy use (insulation, heating and/or cooling), water consumption, waste disposal, land use, biodiversity, etc. Successful efforts to support sustainable housing must focus on people, buildings and infrastructure, while infrastructure also includes the way houses and neighborhoods are built and connected. Effects of construction and demolition of buildings are good example on how housing contributes to negative effects on the environment by the creation of greenhouse emissions, waste, deforestation, mining, loss of biodiversity and chemical hazards.

Interestingly, housing affects the social aspect of sustainable development as well as behaviors, including community life or the rate of crime.

3. Mobility/transportation

Frequency, distance, and form of transport are limited by the infrastructure but are still in hands of people who can base their decisions on cost, convenience as well as greenhouse emissions. The typical mobility needed by the average user is the transport to a place of work or to go for vacation.

The sustainable practices, selection of technology (electric vehicles, video conferencing, etc.) or ways of transport (walking, cycling) can help to lower carbon footprint, air pollution and protection of natural resources and ecosystems.

4. Consuming

While the products people buy and use identifying users' image and habits, they also impact society and the environment (mining materials and using fossil fuels). Typical examples of consumer goods, including but not limited to, are electric and electronic appliances, clothing, cosmetics products. The sustainable practices can help reduce household environmental and social impacts by reducing the material consumption and ecological footprints of those involved.

Moreover, the disposal of products mainly electric and electronic devices creates electronic waste and pollution. The results of fast-fashion leading some middle-class consumers to create a pattern of wearing clothes for a very short period and disposing quickly. This pattern has implications for pollution, chemical usage, increased transportation and packaging.

Social impact of consumption and fast production is negative dominantly in developing countries where the human rights and safety are often in question. On the other hand, in case of cosmetics, the animal cruelty in production and research phase (animal testing) lead to harm or kill the animals De Leeuw (2002) and Power & Mont (2010).

5. Leisure

Leisure time is about experience, it involves entertainment, travel destinations and activities that are affecting all three aspects of sustainable development, economic, environmental and social. It relates to a different level of materialism and social interactions, from book reading, playing a game in virtual reality, skiing to staying in 5-star hotels by the sea.

Relative to leisure activities some of the negative effects are: biodiversity loss, stress on key resources, land fragmentation, and loss of cultural heritage.

Aspirations and behaviors

Personal aspirations and actions/behaviors contributing to a sustainable lifestyle are identified in the Table of Aspirations and behaviors divided by Areas of Sustainable lifestyle below. The aspirations neither behaviors are not exhausted and shows only selected examples, moreover they are not pared down to a minimum viable action. Nevertheless, they provide examples which could be leveraged in the practical-design part of the thesis. These examples are drawn from a variety of sources mainly from COP21, Paris Agreement (2015) and from the article by Williams and Dair (2007) and Defra's Sustainable lifestyle framework (2011).

AREA	FOOD				HOUSING					MOBILITY				CONSUMPTION						LEISURE			
ASPIRATION	I want to cook and/or manage a healthier diet	I want to lead a vegan lifestyle	I want to waste less food	I want to grow own food	I want to use energy wisely	I want to use water wisely	I want to compostre bio-waste	I want to use less chemicals	I want to create less waste	I want to use sustainable means of transport	I want to buy or replace a vehicle for eco-friendly option	I want to decrease my travel to work	I want to travel long journeys eco-friendly	I want to use eco-products and services	I want to borrow or hire products or services	I want to use second-hand or recycled products	I want to own and give high quality goods and/or services	I want to practice minimalism	I want to repair, recycle or donate goods	I want to use community recources	I want to use outdoor spaces	I want to be improving the environment	I want to avoid tourism to sensitive biodiversity hotspots
EXAMPLE OF RELATED BEHAVIOUR	Choose local, fresh, in-season and/or organic products	Eating necessary minerals and vitamins.	Shirt for quality and safety.	Grow own herbs	Installing/shopping up loft insulation or cavity/solid wall insulation or double glazing	Use water saving devices (low-flush toilet, water efficient shower head)	Home composting garden waste, Using peat free compost	Use natural cleaners	Recycle plastics	Cycling	Buy/own emission models	Work from home	Use lower-carbon alternatives - trains	Using labelling to choose most energy and water efficient products	Borrowing or hiring electrical goods	Choosing 2nd hand furniture and clothing	Tailored clothes and goods	Avoid unnecessary products promotions and discounts	Repair broken products	Swapping skills	Using your local green spaces	Volunteering with a local or national group	Choose low impact activities such as eco-tourism
	Increase proportion of vegetables, fruit, and grains in diet		Join urban garden		Upgrade heating and hot water systems (boiler)		Home composting food waste	Using right amount of detergen.	Recycle paper	Walking	Using electric vehicles	Use video conferencing	Combining trips while using more sustainable travel options	Choosing fairly traded, ecolabelled and independently certified food	Using local hire / share-b (swap schemes for tools etc.		Give experience presents instead of goods.	Install add-block	Give away/donate old but still usable items	Using local shops	Buy your own hive	Participate in local decisions and urban planning	
	Decrease or eliminate consumption of animal products (particularly red meat)		Plan meals ahead	Grow own vegetables	Generate own energy by installing renewables (Wind, solar/electric, solar/water, micro-CHP, ground and air source heat	Fix dripping taps		Ditch the air-conditioner and buy an aspidistra, plants help cut pollution.	Use reusable glass bottles and avoid plastics	Using public transport				Avoid private car use, single-occupancy driving	Comparing energy use within community		Use Rechargeable Batteries			Working with community to grow food			
			Distinguish sell by/from best before and use by dates		Manage temperature (Fitting & using temperature control) an adjust thermostats to recommended temperatures (20-21ºC in winter and 25-26ºC in summer).	Use rainwater and a water butt			When shopping, use reusable bags and avoid products wrapped or packaged in plastic.	Share the car with other people whenever you have the chance to do so.				Avoid one time use products such as plastics	Join a tool library or rarely-used household tools and appliance					Sharing knowledge and skills			
			Buy only what you need		Washing & drying laundry using minimum energy & water programme (Line-drying laundry, Switching to green energy tariff,washing clothes less often or at lower temperatures)				Avoid using wet wipes and paper wipes. If you do use them, do not throw them down the toilet.	Whenever possible, use the vehicle that pollutes the least				Purchase fair-trade, cruelty-free and eco-friendly products	Rent less-frequently used products instead of buying					Join and use library.			
			Reuse leftovers		Unplug device when not in use.	Wash your clothes with cold or lukewarm water.			Curtail junk mail	Check your tire pressure to make sure it is not low, which will increase your fuel consumption and emit CO2.				Bylever bottles									
			Cook in community		Use pressure cookers and steam cookers to reduce cooking time.				Cancel paper statements and start using e-statem	Whenever possible, use the vehicle that pollutes the least														
			Donate extra food		Using eco-labelled and energy efficient appliances	Take a shower instead of a bath and remember to turn off the tap when scraping yourself and brushing your teeth			Bring your own bags to the market.	Combine public transport with cycling to cover longer distances, if necessary.														

Figure 2: Table of Aspirations and behaviors divided by Areas of Sustainable lifestyle (available in ANNEX: 1)

This table offers a list of behaviors only into some extend due to time and content limitation of the thesis. Nevertheless, for an easier implementation into design processes the ideal scenario would be to list behaviors in the simplest form, also called minimum viable actions. These actions are according to Wendel (2013) the shortest, simplest versions of the target behavior that the users absolutely must take to achieve an aspiration. The minimum viable actions should be easy to do (less mental and physical effort required, the more likely the user is to do it) and be familiar (people are more comfortable when they have seen it before and actions that they have taken before). The same principle to specify behavior to its minimum valuable steps is used by Fogg in his book Tiny Habits and would be used later in the design phase of this thesis.

2.2. Lifestyles after COVID-19 disruption

During the period of the time in which this thesis was developed one of the unprecedented situations, biggest world-wide human crises, has been happening due to sudden spread of the COVID-19 virus (the Public Health Emergency of International concern was announced by WHO on January 20, 2020, and the virus pandemic on March 11) and caused disruption in society. The thesis was finished before the end of the crisis and thus the future predictions on change in behaviors and lifestyle are speculative. Nevertheless, the behavioral science and the history suggest that COVID-19 would transform daily lives of population for the long term and the extensive social and behavioral change would keep on even after the end of the crises.

Following synthesis are focused on identifying possible scenarios and opportunities that could be transformed to product design and strategy and utilized in the practical part of this thesis.

2.2.1. Effects of COVID-19 disruption

During the pandemic, people were forced to change their lifestyles (behaviors and habits) and have taken up new ways to learn, work, entertain themselves, connect with others, and increase wellness while at home (such as online fitness apps, physical and mental telemedicine). It had effect on a great variety of areas.

1. Environment

The global response to COVID-19 has exhibited environmental benefits. Emissions have dropped temporarily, and the worldwide demand for coal and oil lowered as well mostly due to the decline in demand from transport and manufacturing.

Long-term positive effects depend on whether advantages of this shift in behaviors would be harnessed. The experience with improved environmental conditions, such as clear air and water, spread of greenery in the urban areas and come back of wild animals, could affect ethics and social norms. Thus, there is a possibility that priorities would shift not only on individual level but also on the level of governments. As an example could be considered city the of Barcelona, where spontaneous spread of local vegetation (and no maintenance), that happened during the lockdown, would be supported even after with a goal to transform more areas to wilder nature (Angulo & Angulo, 2020).

On the other hand, it is speculated that people would remain hesitant to return to international travel, large public gatherings, and trips to the shopping mall once the effects of COVID-19 decrease.

2. Consumption

According the report A global view of how consumer behavior is changing amid COVID-19 by McKinsey, people have shifted toward digital products and services across categories, but that shift has not come close to offsetting the overall reduction in spending (Bhargava, et al., 2020). Consumers have expanded their usage of delivery (including food), moreover consumers expect to shop less frequently in physical stores for items other than grocery, simultaneously shifting that spending online even after the crises.

According to Future Consumer Index: How COVID-19 is changing consumer behaviors (Rogers & Cosgrove, 2020) of the middle to high income (cautiously extravagant) consumers after the crises would respond strongly to purposeful brands, purchasing from companies that they feel are doing good for society. The same group of customers believe that the way to travel, shop, spend time with family, socialize, buy and maintain health would change the most.

Some of the insights in data from the Future Consumer Index suggest population is heading to a future like Society first, others point to a contrasting scenario called Waste nothing. The characteristic of this scenario is that people would treat time, talent and natural resources as equally precious. Thus, one of the possibilities in post-crisis world is that consumers would become more mindful about the consequences of their choices. This would drive a need for more transparency and traceability.

3. Privacy

Based on the Future Consumer Index, attitudes around privacy would change to the extent where not sharing data would be considered as selfish. 53% of respondents would make their personal data available if it helped to monitor and track an infection cluster. In other words, citizens would make private information available, if it’s for the good of society. That would accelerate the demand for greater product traceability, creating an environment in which users and companies operate with transparency

2.3. Design for behavioral change

Billions of individuals living on planet Earth will not change their behavior and lifestyles in a harmonised way (if we do not consider the situations as COVID-19). Everyone has different needs and goals, different aspirations, interests, knowledge, belongs to different social class and comes from a different background – all of this having implication for patterns and levels of individual behavior (Mont 2009). In addition, people have different reasons and motivations to change behavior (PIRC, 2011; BBCSD, 2010). Hence, to design for behavioral change that leads to change of lifestyle, needs to be based on personal aspirations of individuals. Therefore, clear understanding of what users' aspirations are in core of design for behavioral change and in this thesis they will be recognize as an entry point for design process.

2.3.1. Behavioral change design

The first academic formalization of Behavioral design as a Design Framework dates to 1990s and early 2000s in a work of B.J. Fogg. "Behavioral Design is a framework for intentionally and systematically changing human behavior through persuasive modifications of the physical and digital environment." (Combs & Brown, 2018, p. 15) It can offer explanations and models that explain why people are behaving in a certain way. It can also predict what they might do next, or how they might respond to certain types of interventions. It uses techniques to increase the chance that someone changes their behavior without forcing them to or violating their autonomy or dignity. Thus, it can help in the design of specific behavioral results by strategically modifying how product environments look and feel, how product clues users' behaviors, and how they respond to their behavior. In order to keep the behavioral design ethical, it needs to be transparent, aligned with social good and a user's desires.

Moreover, a variety of research has been done on behavioral change, two of the most noticeable are:

- Ajzen's Theory of Planned Behavior which focuses on how people's interactions to act are formed as a product of attitudes, norms and perceived control over the behavior (Ajzen, 1991)
- Prochaska and Velicer's Transtheoretical Model, which looks at the stages of change that a person goes through from starting to contemplate an action to changing the behavior and maintaining it (Prochaska & Velicer, 1997).

None of them explain specific actions that could be done to support action, these theories are consisted to be less practical for design process and further usage was omitted in this work.

2.3.2. Elements of behavior

According to Wendel (2013), in order to encourage people to do a particular behavior they have to be somehow prompt to think about the behavior, avoid negative intuitive reactions to it, convince people's conscious minds that there's value in the behavior, convince them to do it now, and ensure that they can actually do the behavior. But he also explains, in agreement with Fogg, that the evaluation and timing play less crucial role in habit because the mind is on autopilot (Wendel, 2013).

In order to design for a behavioral change, elements of a desired behavior need to be understood. It helps to narrow down the design efforts on missing/insufficient element and specifies design strategy. While Fogg Behavioral Model defines 3 elements of behavior: motivation, ability and prompt (MAP). Wendel who built his model upon the Fogg model takes into account in total 5 preconditions to behavior: cue(prompt), reaction, evaluation, ability and timing. The difference between these two models, which are followed in this work, is the behavior which occurs once in the Wendel's model and behavior habitual which is focus of Fogg's work. Following list explores these elements of behaviors in closer look from both authors:

1. **Prompts (also called cues or triggers)**

No behavior happens without prompt. Prompts can couch person's attention or can appear when is a person looking for them. Moreover, it is also possible that people have no idea what the prompt was to do the behavior. With current technology people are experiencing hundreds of prompts daily and are not even aware of it. Fogg (2019) and Wendel recognize following types of prompts:

- **Internal/Person prompts**: It comes from thinking about something through net of associated thoughts. When using internal prompts, the user is relying on himself/herself to remember to do action. It is unlikely to lead to meaningful long-lasting change.
- **External/Context**: It comes from anything in the environment. Based on Fogg these clues are suited for one-time behavior but Wendel explains that the external clues could be placed to user's environment and by using slightly different cue each time, the risk of being ignored by user could be avoided
- **Action prompts/Anchors** – recognized by Fogg only due to their relevance to and habit creation are based on existing routines. Anchors are helping people "attach" new behaviors/habit to old ones.

2. Reaction

Prompts naturally leads to a reaction. When people think about some action, they activate the memories and thoughts about other related concepts. In case of habits, the reaction might automatically initiate the action based on the prompt. Conscious minds can override or ignore what our intuitive system express, but it will feel wrong and it's hard to maintain the behavioral change if it intuitively feels wrong (Kahnemann, 2011). This element is later on in the thesis omitted because it is considered to have an overlap with cue and action itself.

3. Evaluation

Evaluation is typically a process of intensive thinking that happens mostly when the user is facing a novel situation and doesn't have an automatic behavior to trigger. The evaluation could be very rapid, when the action isn't important, or is very familiar. On the other hand, it doesn't happen in case of habit, therefore Evaluation elements are not part of design habitual behavior.

The examples of design strategy are highlighting benefits, minimizing costs/physical or mental effort, downplaying alternatives. The product must offer to user something the user already wants right now more than other alternatives, otherwise the action won't happen.

4. Ability

Ability is fundamental element of behavior, which is easier to design for, making a behavior easier to do. Based on Fogg, ability element has five dimensions which he describes as chain:

- time,
- money,
- physical effort,
- mental effort, and
- routine
  +
- In addition, Eyal (2014) defines one more factor: social deviance.

Only if all dimensions of the chain are fulfilled, the ability of the user to perform a specific behavior is sufficient. Therefore, the understanding of which dimensions of the ability chain are lacking creates an opportunity for design for behavioral change.

5. Timing

Timing and decision when to act is affected by motivation. According to Wendel, decision when to take an action can be driven by following senses

- External urgency,
- Internal urgency (biological need, mental states etc.),
- Specificity (putting a specific time on an action) and,
- Consistency (commitment to act on specific time).

The examples of design strategy are time sensitive content, product aligned with existing events, hook to similar existing user action, etc.

6. Motivation

The behavior cannot happen without motivation. Motivation is unsustainable element of behavior which can come in waves and can fluctuate periodically (for example with weather seasons) as well as once time only. Moreover, one person could have set of conflicting motivations.

While Fogg define motivation as one of the elements Wendel covers it in reaction and evaluation elements, which makes it harder to define. Three sources of motivations are:

- yourself (what you already want),
- benefit/punishment received by doing the action, and
- context.

Therefore, when designing for behavior, the motivation should already exist at some level. Motivation is the most difficult element of behavior to design for when the goal of the design is long-term behavioral change or habit.

Following six key levers of motivation are basis of anything that gets people to do something (by boosting motivation):

- Seek hope - avoid fear
- Seek social acceptance - avoid social rejection
- Seek pleasure – avoid pain

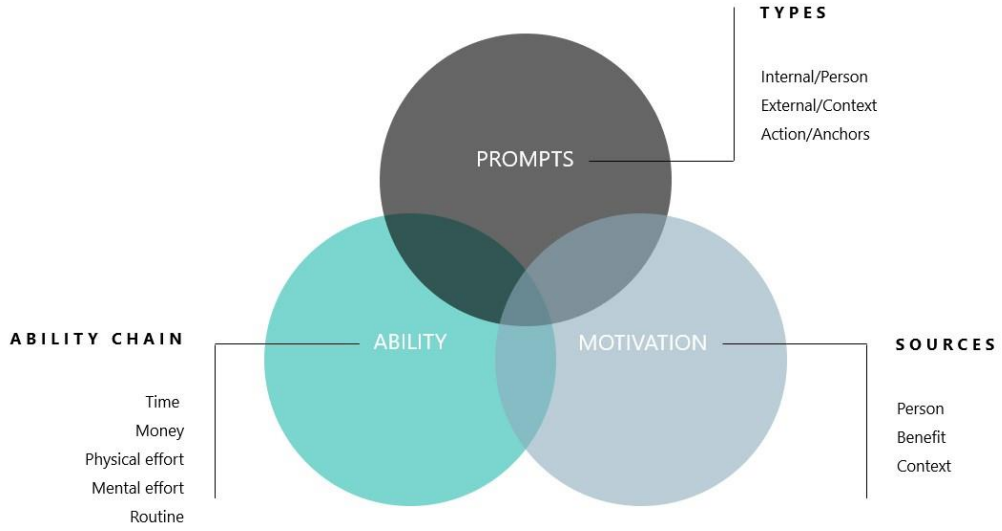

Figure 3: Overview of elements of behavior

2.3.3. Behavioral models

In order to design for behavioral change numerous models were developed by academics and practitioners in past. While this thesis explores several of them in theory, the practical part of the thesis is grounded mainly in one behavioral model by Fogg which was made with digital product development process in mind. The following list describes all explored models:

1. **The Action Funnel**

The Action funnel by Wendel (2013) is a guide to illustrate where people are dropping off in adopting to a new behavior based on product design composed by 5 elements of behavior (CREATe): Cue which starts intuitive reaction, potentially evolving to a conscious evaluation of costs and benefits, the ability to act in the right timing of the action are prerequisites for behavior/action.

Each section of the model interacts with each other. Weaknesses of one area could be balanced by strengths by other. It also has weak points, when the user can drop off, and not continue to the next step (not proceeding with the action). Each time the funnel is different, even for the same person.

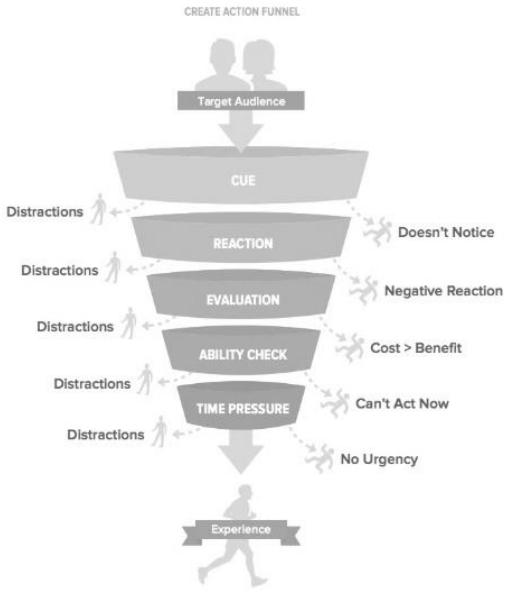

Figure 4: The Create Action Funnel, Wendel (2013)

From product design perspective, following things need to be considered:

- How well the product guides the user through the funnel stages
- What else is competing for time and resources of user (destructions of individual 's environment)

For better understanding of funnel, the following list illustrates possible user problems in funnel per element of behavior:

- Clues: user forgets (no reminder in the environment) to act or has limited attention
- Reaction: user don't trust the product/company, it feels unfamiliar
- Evaluation: the costs are too high, and user is not motivated enough
- Ability: user don't know how to act
- Timing: insufficient urgency

2. Fogg behavioral model

Fogg argue that in order to a behavior to occur, three elements: motivation, ability and prompt (MAP) must be over the "action line" which is presented in the diagram below. It means that users' motivation and ability need to be over certain level and the behavior could happen only if there is also a prompt for the behavior. Designer could help user to increase one of these elements, for example improve a specific ability (see ability chain) to act or their motivation. Even a prompt could be designed. This logic of analyzing and evaluating elements of behaviors is applied later in this thesis in a part dedicated to the product design.

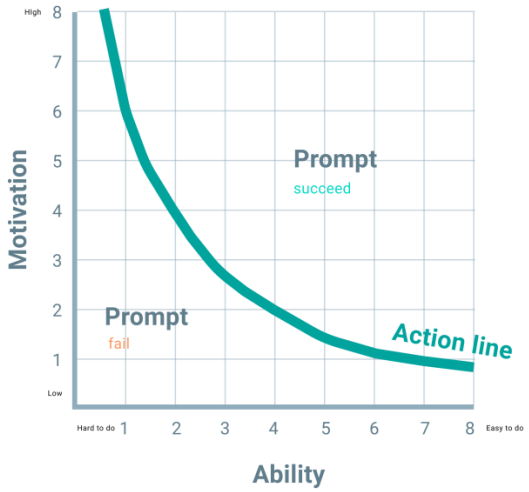

Figure 5: Fogg behavioral model, Fogg (2019)

Remarkably, the Fogg model in its basics structure of behavior reminds the model on what motivates people's consumption behavior. The widely referenced Needs-Opportunities-Ability model looks at consumption from the macro-level of society and the micro-level of the household by Vlek and Gatersleben (1998) and OECD (2012). It assumes that given the opportunities and the necessary abilities, people would pursue fulfilling their needs and desires (including relationships, development, comfort, work, health, money, status and safety) to improve their quality of life.

3. Hook Model

Hook model is a framework for building products that solve user needs through long-term engagement (habit). It is based on four phases (Eyal, Hooked, How to Build Habit-Forming Products, 2014):

1. Trigger: recognize only two types internal (routines, people, situations, places) and external triggers (click here, buy now, friends recombination) which needs to be coupled in context
2. Action: is understood as the simplest behavior done in anticipation of a reward (it follows Fogg behavior model: requires sufficient motivation, clear trigger and ability to do the action)
3. Reward: increase the variability (mystery) of the reward
4. Investment (of user): something that user puts into the product for a future benefit.

The phases three and four, reward and investment, are additional in comparing with Fogg's model and are in this thesis understood as curtail for designing a product. Thus, they are deeper described in following part:

- Three types if variable rewards are:
    - Tribe (empathetic joke, cooperation, competition)
    - Hunt (search for material possessions: food, shelter, clothing, information and money)
    - Self (search for things that intrinsically pleasurable: mastery, consistency, competency and control)

- Investment increases the likelihood of another pass through the hook model. It is about the anticipation of longer-term rewards, not immediate gratification. It could be done in two ways:
    - Loading the next trigger (user did something to go back, like sending message in order to receive reply, the external trigger is notification about the reply)
    - Sore value (it makes products and services appreciate)
        - Data (the more data a company collects about the user the better it becomes) ex. Pinterest
        - Content (more files user stores in the cloud service, better the service becomes) ex. Drive
        - Reputation (better reputation the user has on the side, more he/she can charge) ex. Airbnb
        - Followers (more follower a certain service has, then it has a higher value) ex. Twitter

4. Other models

To showcase the example of models and strategies for behavioral change towards sustainability provided by literature, the Comprehensive Action Determination Model (CAD) model was selected. It explains that individual, sustainable behavior is directly determined by influences from three possible sources: habitual, intentional and situational (Klöckner & Blöbaum, 2010). Even though the CAD model omits the application in the digital design it is representing the opportunities of future research.

On the other hand, Bhamra et al.'s model makes a connection between design strategies and Triandis' theory which showcase on one side interesting way for design but on the other it is missing social and economic dimension. Thus, it wasn't explored further in this thesis.

2.3.4. Categorization of behavior

Behavior Wizard is used in this thesis to clearly articulate behavior and categorize it. The basis for the Behavior Wizard is a matrix called the "Behavior Grid" that defines 15 types

of behavior, in two dimensions. In this matrix, each row and column represents one characteristic. The horizontal axis of the grids is related to The Refuse, Effuse and Diffuse (REDuse) but it goes beyond by specifying whether the behavior is new or familiar. The placement of behaviors into one of the five options in horizontal axis, especially for Blue and Green Behaviors, depends on the person who is the target of behavioral change. The vertical axis, which has three option related to frequency: one-time, specific duration and pattern, assists with designing of triggers of behavior.

	GREEN Do new behavior	BLUE Do familiar behavior	PURPLE Increase behavior intensity	GRAY IDecrease behavior intensity	BLACK Stop existing behavior
DOT One time	**GREEN DOT** Do a new behavior one time	**BLUE DOT** Do familiar behavior one time	**PURPLE DOT** Increase behavior one time	**GRAY DOT** Decrease behavior one time	**BLACK DOT** Stop behavior one time
SPAN Period of time	**GREEN SPAN** Do behavior for a period of time	**BLUE SPAN** Maintain behavior for a period of time	**PURPLE SPAN** Increase behavior for a period of time	**GRAY SPAN** Decrease behavior for a period of time	**BLACK SPAN** Stop behavior for a period of time
Path From now on	**GREEN PATH** Do new behavior for now on	**BLUE PATH** Maintain behavior from now on	**PURPLE PATH** Increase behavior from now on	**GRAY PATH** Decrease behavior from now on	**BLACK PATH** Stop behavior from now on

Figure 6: Fogg's Behavior Grid specifies 15 types of behavior change, (Fogg & Hreha, Behavior wizard: a method for matching target behaviors with solutions, 2010)

By categorizing the behavior, positioning behavior in the grid, the evolution of the behavior could be planned and designed easier. Moreover, it could help to choose the design intervention for a given behavior.

2.4. Role of technology

2.4.1. The bottom-up approach

Linear system production, a take-make-waste process, is in this thesis seen as a narrow way of thinking that results in significant natural damage of resources which supports life. Thus, it is not the right approach for sustainable lifestyle which requires understanding of need for transforming linear thinking to cyclical thinking. Instead of consumption of single use products people would consume products that have lifecycle with closed in loop. As it is in nature, where is no such a thing as waste (William McDonough). This approach is recognized as Circular economy and is important for sustainable lifestyle. In line with circular economy is the Service-dominant logic, which is transforming the way of seeing ownership and changes the nature of consumption. New Radicalism (Ezio Manzini) suggest three interrelated scenarios: product longevity, owning less and shift from owning products to accessing services. If followed, this logic changes the way of living and lifestyle and could be nourished by individuals. Service dominant logic has manifested itself in two different trends, Service design and Sharing economy channeled via smartphones and mobile applications. Both trends inspired the approach taken in this thesis, mostly in aspects of the design process and product strategy.

Although this thesis recognizes the importance of governments and the private sector in building sustainable lifestyles, it focuses on individual behavior in order to support the button-up change of society by change of lifestyles. Changes that emerge from grassroots activities. Change which is forced from people, billions of individuals – citizens and consumers. It is believed, that transformation of customers' demands on market will transform the market. Moreover, this approach is in line with Heiskanen, Lovio, and Jalas (2011) who recognized the bottom-up approach as pivotal in opening new avenues and fostering acceptability of sustainable solutions.

When considering the specific approaches, this thesis is inspired also by The Refuse, Effuse and Diffuse (REDuse) framework, published by UNEP in 2016, which supports bottom-up approaches for a sustainable lifestyle and helps to categorize behaviors. The framework is built upon the three basic components that support sustainable lifestyle interventions:

- Refuse: targets negative-impact activities by discouraging harmful choices (boycott, avoid, reduce)
- Effuse: It targets positive impact activities that are sustainable (eco-innovate, do-it-yourself, reuse, conserve)

- Diffuse: collaborative engagement actions with wider communities that provide solutions and reduce environmental impact (share, collaborate, localize, eco-innovate)

2.4.2. Smart-phone technology

Using technology to change people's behavior in a certain way has been an increasing field of study which evolved to practice of behavioral change design. Such design is meant to stimulate desired behaviors or to avoid undesired ones. It can be applied in a variety of disciplines by variety of technologies. In case of this thesis it was applied in the field of sustainable development, understanding that supporting sustainable behaviors of people would be particularly positive change for society using the most influential technology nowadays.

Currently the most influential technology is the smartphone. Its dramatic increase in usage and the omnipresence provides a new powerful set of tools for designing for behavioral change. This device while being tightly integrated with people's environment is capable of real time sensing (using accelerometers, cameras, microphones, GPS) and constantly connected to the global computing infrastructure able to collect and share data. Moreover, smartphone is crucial center of information for manipulating and displaying data to user collected from wearable devices such as sport watches, rings, heart rate strap and more (using sensors for cadence, stride length, vertical oscillation, vertical ratio and more) as well as smart devices such as smart fridge, home assistant (Alexa), smart house thermometer (Nest) and many more.

Relying on data has recently become a realistic option for design, because vast amounts of data about individuals' behavior are currently collected. Collected data could be processed by a variety of technologies and algorithms, most recently discussed and used artificial intelligence (AI). AI can instantly recommend to an app how to modify its digital environment to induce an user to change his/her behavior.

Moreover, smartphone could be also proactive in demanding people's attention, using push notification technology. It can vibrate, chime, and ping users in deliberate, controllable manners to drive their behavior. These features are seen as design tactics for behavioral change.

Due to smartphone's potential for changing users' behavior and support bottom-up approach, the technology of choice in this thesis is the smartphone. It is used as means to ends of human flourishing, supporting the sustainable lifestyle of individuals.

2.4.3. The Platform Economy

The application of data, sensors networks, IoT, algorithms, and cloud computing changes the structure of economy. The emerging type of economy is the Platform Economy (also known as the collaborative platform economy or sharing economy) (Kenney & Zysman, 2016) that is based on interactions among distributed groups of people supported by digital platforms. In other words, "the Platform Economy is collaborative in so far as it favours peer-to-peer relations (unlike the traditionally hierarchical power structure, absence of sociability in contractual relations and purely mercantile exchange) and distributes value and governance among the community of peers. It is collaborative when profitability is not its main driving force, when it carries out its activity on a public infrastructure aware of the importance of privacy and generates generally open access to commons resources that favour accessibility, reproducibility and derivativeness, and finally it is collaborative when it cares about the externalities generated and about favouring the inclusion and reduction of the environmental impact." (Fuster Morell, 2020)

This economy is growing fast, attracting a lot of interest and has become a priority for governments all over the world. While the most known examples of such economy are commercial companies such as Uber, Glovo or Airbnb (while claiming to be part of Sharing economy, they are not based on "sharing"; rather, they monetize human labour and consumer assets), socially responsible platforms also exists for example Wikipedia, and Couchsurfing.

The Platform Economy has generated expectations due to its opportunities to contribute to the sustainable development. It could operate within framework of circular economy, mentioned previously. It nurtures an atmosphere of vibrancy, innovation and economic prosperity by creating chances for individuals and communities to interact, support and benefit from shared interests (Sharing Cities Declaration, 2018). In this thesis the Platform Economy model based on collaboration and sharing is seen as an opening for mediating behavioral change towards sustainable lifestyle via smartphone technology.

Furthermore, continuous growth of the Platform Economy impacts the life of the citizens and development of the cities. This specific scale was identified as additional opportunity in this thesis and would be applied to product strategy and in recognizing the target audience for the product.

2.5. Conclusion

Sustainable lifestyle intent to ensure that everything people do, have, use and display meet their needs and improves their quality of life while minimizing the consumption of natural resources, emissions, waste, and pollution and ensures that resources are protected for generations to come. The tangible results of the sustainable lifestyle are far in the future, thus the motivation to lead such a lifestyle might be low and very difficult to design for. Therefore, for designing behavioral change towards sustainable lifestyle the remaining elements of behavior prompts and ability would be the objects of design for behaviors that are proven to have sufficient level of motivations.

When selecting a technology to mediate behavioral change towards sustainable lifestyle in this thesis, smartphones and mobile applications are recognized as the most influential technology nowadays and thus, they were selected for purposes of practical part · design project.

Moreover, based on the research, the selected product strategy is service-dominant strategy, that helps to change behaviors of individuals within the community by improving the access to information and services, while being aligned with the circular economy principles.

“BUILD THE CHANGE YOU WISH TO SEE IN THE WORLD.”

Nir Eyal

3. Practical part

DESIGN PROJECT

The product design process in this thesis is human-centred, based on design thinking approach. In the parts where products aim to transform the users' behavior, the Wendel's process for designing for behavioral change was followed. Last, but no least, to analyze behaviors of users the Fogg's behavioral model integrated into core of the product. The process is divided in high level to following stages:

- Product conception: In the first steps internal concept vision, target outcomes, target audience, success, and high-level user goals were identified. In the next step, the external (user-facing) product vision and mission were created. In the last step, the main features of the application were defined.

- Product design: Design of Information architecture of the mobile application, user flows, and user interface of the product was created.

- Behavioral design: The design of behavioral change was achieved by research with the target audience. Story framing technique helped with the definition of strategy. The behavioral design was focused on two functionalities of access to information and access to service.

3.1 Product conception

Internal Vision	To foster and promote behaviors and habits of individuals towards sustainable lifestyle by providing access to information, services and shared infrastructure
The target outcomes	To do behaviors that lead to personal aspirations in order to build and maintain sustainable lifestyle.
The target audience	Independent middle-class millennials living in urban areas of Europe (due to their position of having the most influential lifestyles, with the highest impacts driving global aspirations)
Success definition	This product will help user do behaviors in order to achieve own aspirations. When successful, it should improve state of related areas of sustainable lifestyle.
Long term user goal	"To live in a way that provide for future myself and next generations (people I love) quality of life equal or better than the current one." *

Figure 7: Definition of the product concept

*The definition of user need for the product is drawn from informal interviews made remotely with five representants from the target group. The interviews were based on "5 whys technique" to identify root cause of the fundamental-emotional human need or instinct. See results in Annex 8.

Mind map

In order to ideate the solution in the early stages Mind map method was used. Three main areas were introduced to create a solution for complex environment:

- User/person with areas of sustainable lifestyle,
- Municipality, and
- Possible digital solution of mobile application.

The most significant touch points and connections between ideas were identified. The attention was also focused on the flow of data in this network to specify which data might be useful and reused in the solution, including public data, personal data collected by other apps, and data available via Internet of things, that some cities share publicly.

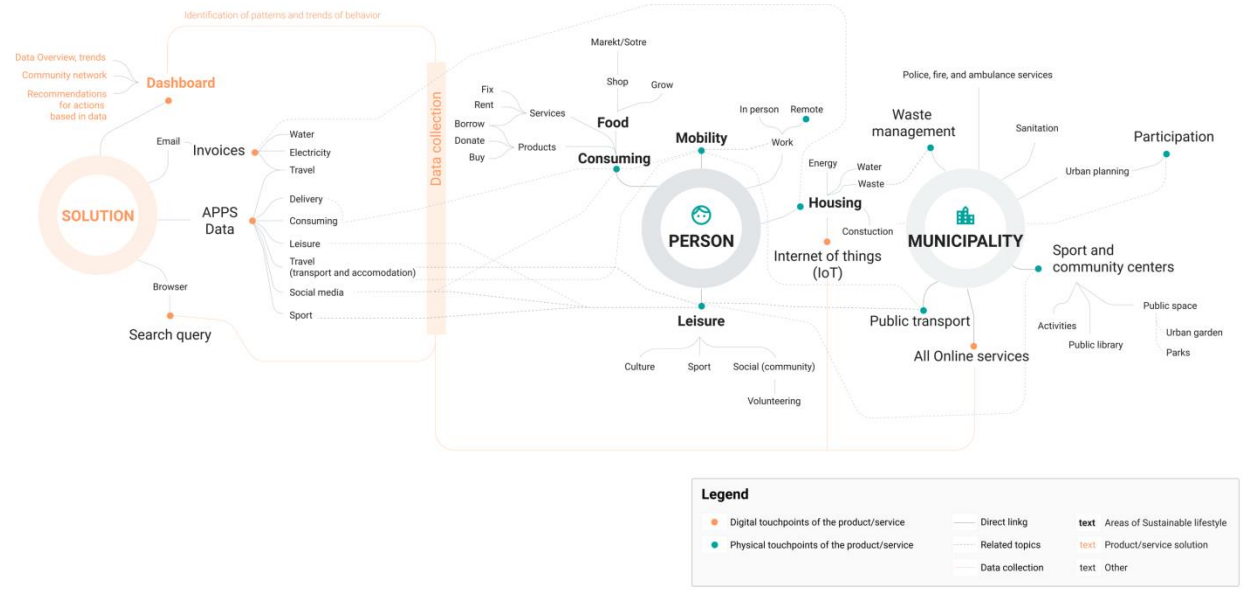

Figure 8: Mind map (available in ANNEX: 2)

The key results of the mind map exercise are identified opportunities:

- to design service-dominant product that provides access to services within user's community,
- to build community located in immediate distance such as neighborhood or municipality,
- to source locally relevant information and share appropriate data,
- to support involvement and participation of the citizens in planning, activities, and service,
- to support community-driven marketplace,
- to enhance community and social relationships, and
- to spread awareness about spending of resources such as energy and water by data visualization.

Identification of innovation(s)

Following ideas (that were collected during literature research from theoretical part and mind map) were identified as innovations:

1. Sustainable lifestyle is broad and long-term goal, which is insufficient in providing motivation for behavior and clear enough instructions on how to behave. Dividing it into smaller portions (aspirations) helps to narrow down the focus into specific goals that the user might have and behavior(s) which he/she is able to do in the present. In result it helps to increase occurrence behaviors towards the long-term goals of sustainable lifestyle.

2. Usage of smart-phone technology and data from variety of sources (public data, IoT, users' data from other apps) to initiate behavioral change in global scale allows fast adaptation of behaviors towards the sustainable lifestyle.
3. Narrowing down the usage of the app into a zone of neighborhood makes the actions more tangible. The other significant advantages of this approach are: identification and involvement of stakeholders, building connected society with relationships among neighbors.

Product concept

The concept of the product is based on the theory that behavioral product can be successful only if it helps people change their behavior to the extent that they care about or in other words, helping them to fulfil existing aspirations. Thus, the key part of the product is identification of users' aspirations and analyses of elements of desired behaviors. It is integrated into the product via Lifestyle profile feature. The remaining features are grouped into a section called Service-dominant product and all together they create a mobile lifestyle application: **OURS**.

THE PRODUCT CONCEPT OVERVIEW			
PART		**DEFINITION**	**PRODUCT LOGIC**
1	**Lifestyle profile**	A feature capable of analyzing users' aspirations for sustainable lifestyle, based in self-assessment	Fogg beh. Model and Beh. Wizard, Behavioral strategies and tactics
2	**Service-dominant product**	A variety of features focused on sustainable lifestyle in community of neighborhood: data visualization (related to sustainable lifestyle and tailored aspirations) and service and information access	Data analytics (IoT, public data, users' apps data) Behavioral change design tactics Hook model

Figure 9: The concept overview of the application OURS

VISION

OURS shaping sustainable lifestyle of communities by providing access to services and top-notch data.

MISSION

OURS virtually accelerates an access to services within a neighborhood community, by providing engaging, personalized, immediate and intelligent information related to services, activities and products that foster sustainable lifestyle.

APP FEATURES:

LIFESTYLE PROFILE

The goal of Lifestyle profile feature is to create **tailored solution** to users' aspirations towards sustainable lifestyle. It is based on self-assessment, using Fogg's behavioral model. Thus, elements of behaviors are identified and evaluated by user: motivation (1-8), ability (1-8), missing parts of ability chain and existing prompts.

Based on this assessment the application is personalized and set of behavioral change tactics are put in a place. The most obvious change is the easiness to access services, that relates to users´ aspirations.

HOME

Feature Home is based on several sub-features:

Consumption dashboard: provides data visualization of the users (household) consumption. The main goal is to increase awareness in areas that could be measured, such as water and energy consumption. Moreover, in each area, related data would be displayed, such as weather, time spent at home, etc. It is dependent on the data infrastructure of the municipality and privacy settings of the user.

Achievements and Leaderboards: the household consumption data are compared with the average consumption in the neighborhood in order to increase a motivation of the user for behavioral change. In a way, a user could compare him/herself in standings, and the element of gamification is introduced. Users can win the crown as a king/queen of the lowest consumption, medal for a personal record, and for being in the top 10%.

Public (city) data dashboard: users from the cities that have built infrastructure to collect and share data as common good would be able to see a summary of data in areas of air quality, waste management, noise, and beyond, of the neighborhood they live in. An example of such a city is Barcelona with its data infrastructure (Side walk labs, 2019).

Activity recommendation: based on the collected data (and users´ aspirations defined in the Lifestyle profile) set of behaviors would be recommended to a user.

MARKET PLACE

The feature **provides access to services and products**. Members of the community could borrow/lend, rent, hire, fix, donate, buy/sell products and services within the community.

The goal of the feature is to decrease consumption of unnecessary products (borrow, rent), increase life-span of the products (fix, donate), improve social connection among neighbors (peer-to-peer interactions), increase financial capital of the users (rent, hire), and increase cooperation among neighbors (babysitting, dog sitting, etc.)

INVITES

The feature invites **provide access to local events**. Members of the community could find/share invites to local happenings such as garage sale, locations for donation collections of clothes, food, etc., workshops, classes, performance, theater, open days, urban planning participation, and more.

The goal of the feature is to improve social connections among neighbors in the urban areas and to promote public participation and joint responsibility.

SETTINGS

Default **notification** settings is focused on desired aspirations and triggers for specific behaviors but could be edited by the user anytime. As the triggers for behavior, they are built upon behavioral change tactics.

The transparency about data usage and easy access to **data privacy settings** allows users to change the settings. It would be available to users anytime in order to protect digital rights through the implementation of Technological Sovereignty policies and ethical digital standards.

The user can select a neighborhood as his/her **community based** on the address where he/she lives. The address must be verified to keep the focus on the local community a user belongs to avoid marketers or businesses to interrupt the community spirit intended by this application.

3.2 Product design

The product design part of the thesis contains user experience and user interface design artifacts that were necessary in order to produce the design of the app **OURS,** such as information architecture map, selected user flows, mock-ups of the screens, and branding elements.

The Material Design open-source design system (Google, 2020) was used to create most UI components for mock-ups of the mobile screens. This design system was selected due to its omnipresence and suitability for Android OS. On top of the design system, a tailored branding was developed, based on knowledge of psychology related to the colors and personality of the target audience.

3.2.1 User experience and user interface design

The numerous of features were structured to the Information architecture map, that is illustrated bellow. It contains a structure of all screens and navigation among them. Additionally, the main sources of data are defined as well.

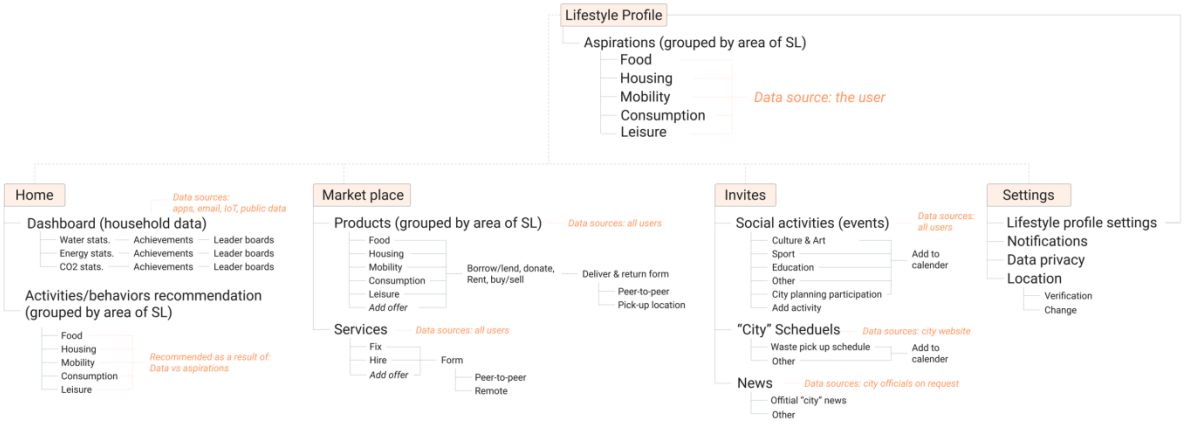

Figure 10: Information architecture of the app OURS (available in ANNEX 3)

While the product is based on numerous user flows, for the purpose of this thesis only flows that represents Lifestyle profile creation and editing were visualized.

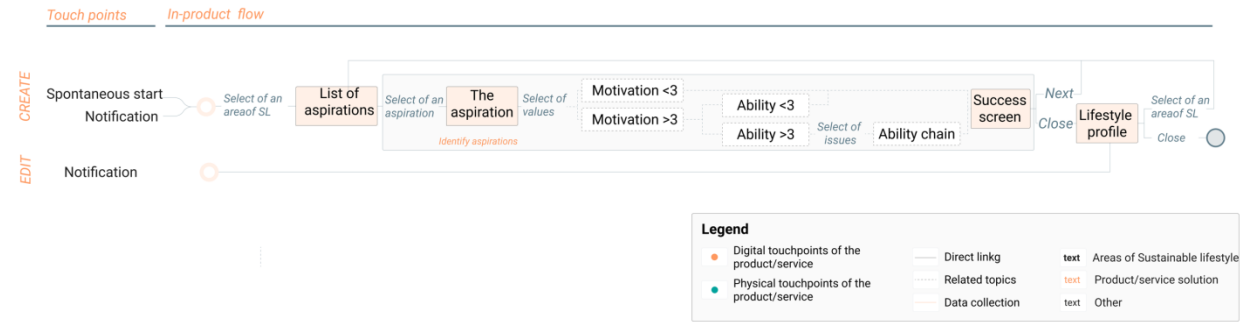

Figure 11: Selected user flows (available in ANNEX: 4)

Following mock-ups illustrate user interface (UI) of the same flows.

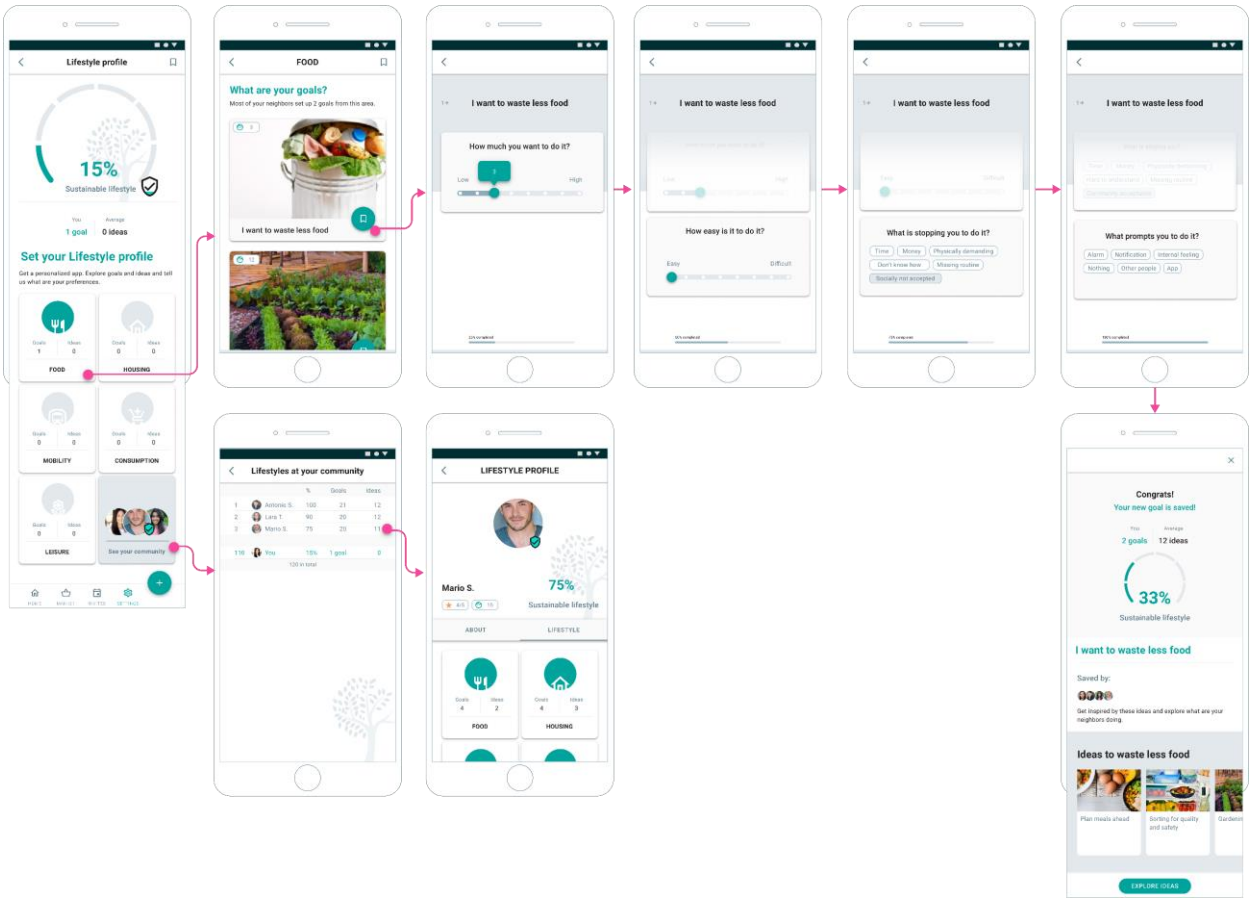

Figure 12: Selected mock-ups (available in ANNEX: 5)

Aspirations in the app called "Goals" are distributed to 5 areas: housing, food, mobility, consumption, and leisure. They are furthermore divided to "ideas" which are actually ideas for behaviors that would help user to achieve the selected "goals". The self-assessment logic is built into the core of the product but to the user is presented on user interface (UI) in a form of a Lifestyle profile that could be shared with community, so tactics such

as social proof and sense of belonging are used to motivate user to create and maintain the profile. The Lifestyle profile focuses also on narrative tactic to help users to see themselves as someone for whom the action and lifestyle is a natural, normal extension of who they are.

The map of all mock-ups

The map of mock-ups of user interface below illustrate the mobile application **OURS**. The knowledge from human psychology and cognitive science is also translated these designs, by using variety of principles such as closure, reward, IKEA effect, fear of missing out (FOMO), social proof, sense of belonging, psychological relief, progressive disclosure, framing, loss aversion, social validation, endowed process effect and more.

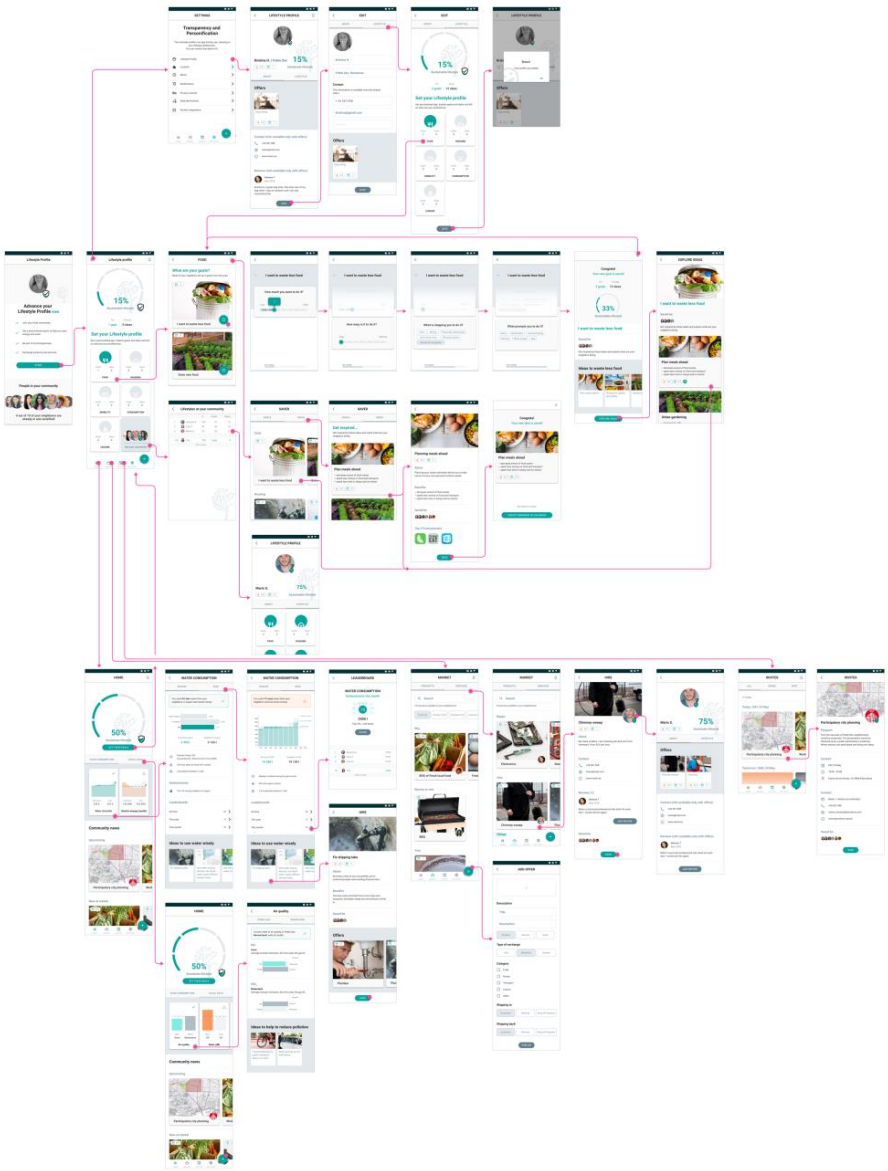

Figure 13: The map of all mock-ups of the app with main interactions (available in ANNEX: 6)

3.2.2 Product branding

Branding is understood as a contributor to behavioral change due to its psychological effects on end-user. The goal of the branding is to translate product values and support mental connection of users with the product – mobile app **OURS**. The branding is built upon the vision and mission defined in previous chapters and it is translated to user interface design of the application.

While a variety of banding artefacts could be created this thesis covers the basic elements of the brand.

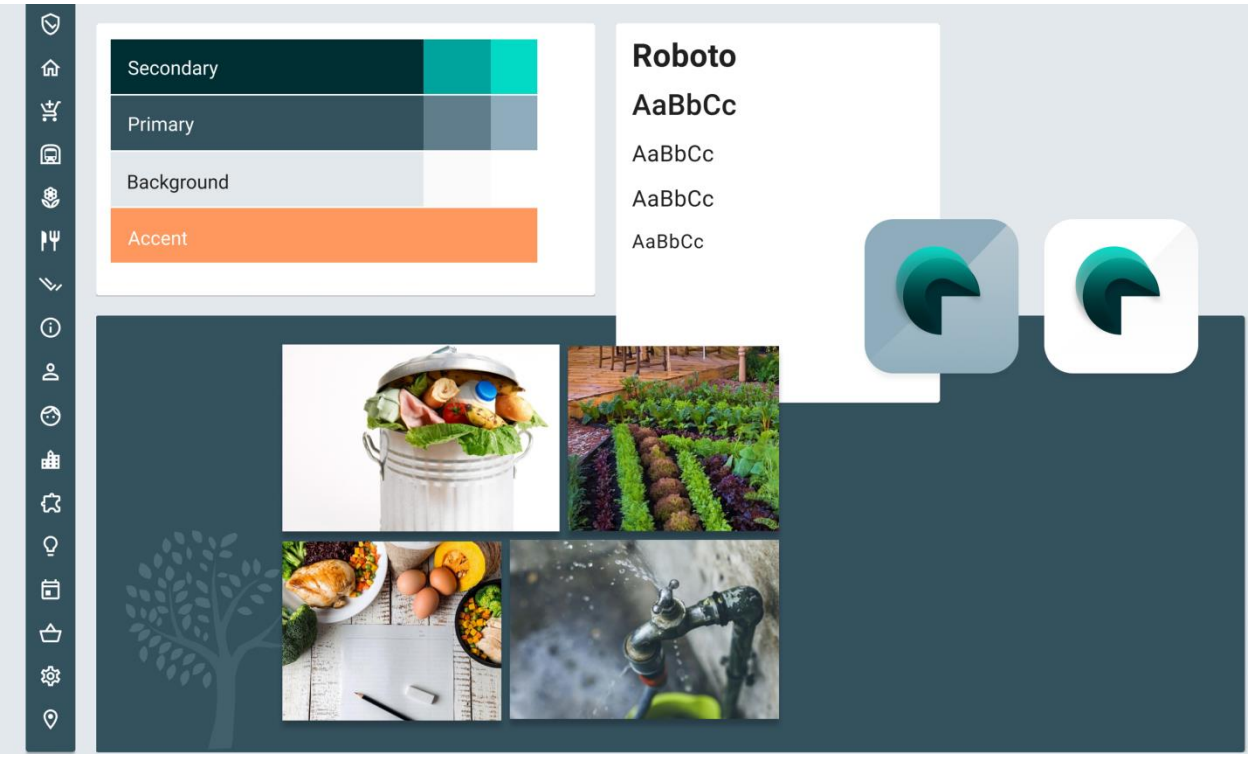

Figure 14: Branding elements

Archetypes

Brand is represented by a set of archetypes, that symbolize complex concept, intangible characteristics that form a brand. Following archetypes were selected due to their impact on the environment via social actions (Laksmidewi & Soelasih , 2018), Both archetypes are equally strong and perceived as the personality:

- The caregiver: protects and cares for others, is compassionate, nurturing and generous;

- The hero: is kindly-powerful, brave figure, who fights against evil, defends the weak and the needy.

Brand values

In order to build deeper connection with end-user of the brand, to boost brand consistency and to inspire brand loyalty, the brand values divided to two categories were identified:

- Presentation: modern, cheerful, honest, down to earth
- Tone: empowering, actionable, meaningful, supportive

Name

The general purpose of the app name is to differentiate and elevate the brand. Additionally, the name reflects the brand values and core purpose of the app. The selected name of the application **OURS** intents to illustrate co-owning of the sustainable future, while sharing products and services; and participating in community life.

Colours

Three colours were selected to represent the brand due to their link to certain emotions with relationship to the psychology:

- blue as primary color representing trust;
- green as secondary color representing nature; and
- orange as an accent colour representing bright and cheerful emotions.

The complementary colour, that completes the tone of the application used as a background is in shared of blue-grey colour.

Figure 15: App branding colours

App Icon

App icon is the visual expression of digital product. It is the first opportunity to communicate, at a glance, app's purpose and core idea in a simple, bold, and friendly way.

Principles that the icon represents are following: simple, clear and meaningful, recognizable, attractive, non-offensive, consistent, scalable and flexible.

Icon of application **OURS**, is meant to remind:

- tree as symbol with multiple meaning: production, life cycle, nature, nourishment, and health,
- circle as a life cycle, product consumption in closed in loop, Circular economy,
- video game Pac-Man, well known by the target audience that brings playfulness to the application
- letter O as first letter used in the name of the application.

.

Figure 16: Draft and the final version of the app icon

All the other functional icons used in the app design are drawn from The Material Design (Google, 2020) as most of the UI components.

3.3 Behavioral design

While the **OURS** app is a complex product with variety opportunities for mediating behavioral change, this part illustrates how behavioral change via smartphone, by focusing on two features: access to service and access to information.

3.3.1 Behavioral change design, access to service

The desired outcome of this part is showcase on selected behavior design solution that could lead to behavioral change. To select only one behavior the quantitative research with target audience was conducted.

Quantitative research
The goal of the research was to identify the most common aspirations among the target audience. The quantitative research was prepared in form of on-line questionnaire taken by 50 participants in April 2020 (during the COVID-19 crisis in Europe). The most common aspiration was identified according the level of motivation (values 1-8, as us used in Fogg behavioral model). The structuring of the areas and aspirations was made according the table built in theoretical part of the thesis. The following graph shows aspirations with the highest level of motivations per area of sustainable lifestyle.

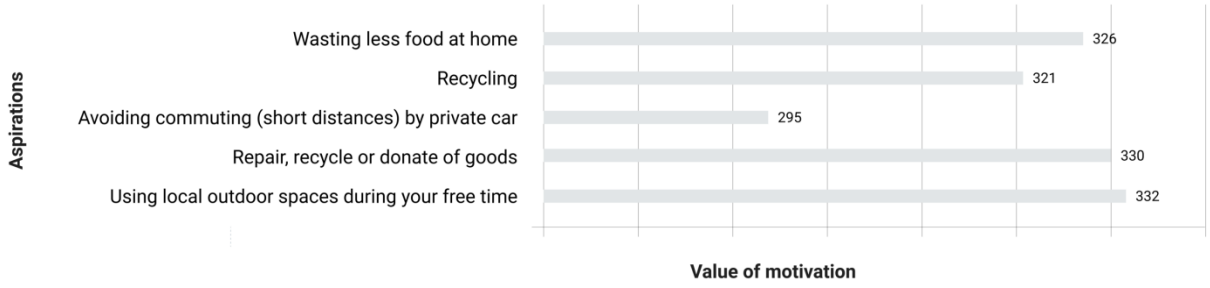

Figure 17: Results of research (available in ANNEX: 7)

Based on the research result and for purposes of this thesis only one aspiration was selected for future design process "to repair, recycle or donate goods" due to its relation to the overall concept of the product: to provide access to services. That was furthermore specified (based on Table of Aspirations and behaviors) to behavior: **Donate unused goods.**

Categorization
The selected behavior was additionally categorized according to Behavioral Wizard, that helps to design the change in behavior the period of time to **Always donate unused**

goods, from now on. Such a categorization would happen with all behaviors that are supported by the product.

BEHAVIOR	CATEGORY						
	stop	decrease	start	increase	one time	period of time	from now on
Donate unused goods			x	x			x

Figure 18: Categorization of selected behavior

Based on Behavioral Wizard the selected behavior is new or rare to the user, and it should be happening for the foreseeable future. The user is ready to change, and he/she needs to adopt new practices and behavior. To achieve this type of behavior, the design needs to alert at least one element of behavior. Since the motivation scored high in the research design strategy would consider alerting trigger(s) and/or ability to do the behavior. Moreover, this type of behavior is characterized by insufficient ability and possibly the presence of fear.

Behavioral plan

Behavior plan is based on the steps of minimum viable action (MVA) where some of the action could be done by a product other must be done by a user. Behavioral plan is in this thesis interpreted via Story framing in which triggers, actions, rewards and investments were identified.

	TRIGGER	ACTION	REWARD	INVESTMENT
1	The user has unused objects at his/her disposal. (Internal and external triggers)	The user searches option in the Internet how and where to donate the object easily and fast.	The user finds an option to use a free app to publish the donation.	Easily sign up for the account. (Increased ability)
2	Welcome banner with suggestion to add donation offer to marketplace.	The user publishes the object with picture and description.	The success screen of published object is displayed.	The user contribution to community.
4	Notification that someone is interested in the item (someone saved the item).	The user reviews the notification.	The user enjoys popularity of saved items.	User builds reputation in the neighborhood.

Figure 19: Story framing

Strategy and tactics

Based on the story framing following tactics were used in the design of the user interface.

- Increase the number of triggers leading to the new behavior

- The product is designed to increase ability of any user to perform behavior (based on ability chain by Fogg)

    1. Time: the sign up is easy and fast, it takes minimum amount of time to sign up.
    2. Money: the service is free
    3. Physical effort: the process is very short, it doesn't take much effort to type basic info for sign up
    4. Mental effort: it straightforward and easy, it doesn't take much effort to do it
    5. Social deviance: there is no deviance associated with the product.

Design for behavioral change

Following mock-ups illustrate user interface (UI) that was designed according the behavioral plan and selected strategy in previous steps.

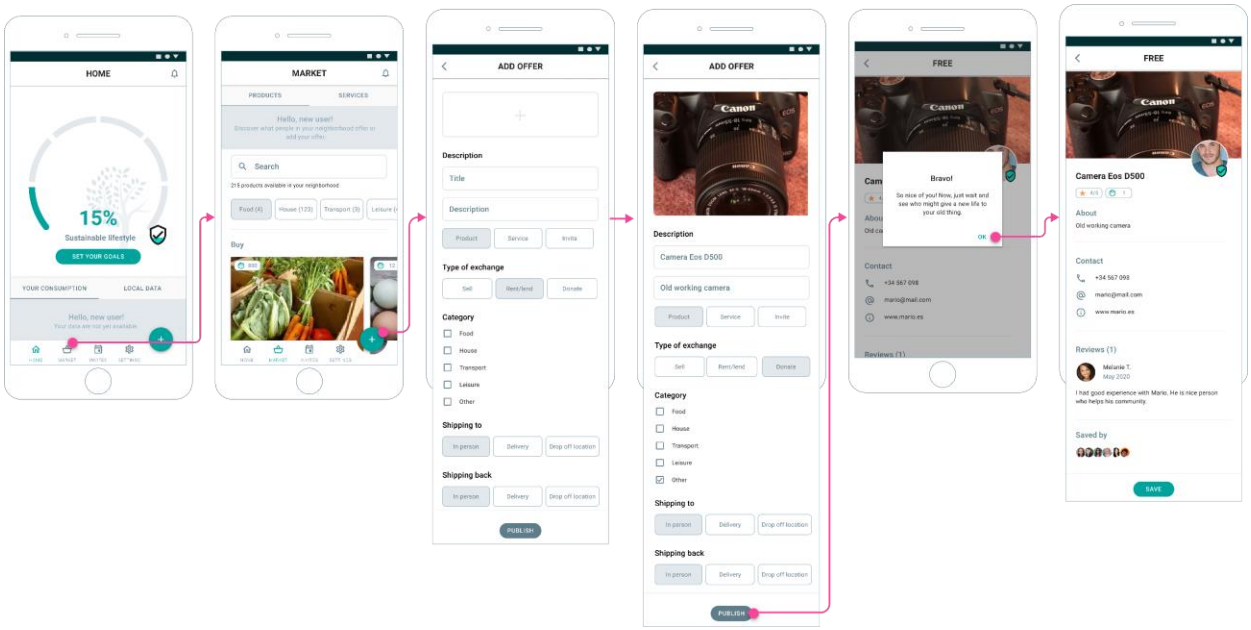

Figure 20: Mock-up in flows: Service access (available in ANNEX: 9)

3.3.2 Behavioral change design, access to information

Similarly, as the previous part, this part focuses on mediating behavioral change via smartphone and its feature to provide access to information. The desired outcome of this part is to design a feature that provides access to information that could influence users' behavior towards sustainable lifestyle.

Strategy and tactics

One of the critical features provided by the application OURS is an access to information about household consumption of energy and water.

- Increase the number of triggers leading to the new behavior
- The product is designed to increase ability of any user to perform behavior (based on ability chain by Fogg)

1. Time: user is regularly informed about the update in consumption data without need to request the information
2. Money: the service is free
3. Physical effort: the data are sorted and visualized automatically
4. Mental effort: it straightforward and easy, it doesn't take much effort to understand the visualization
5. Social deviance: there is no deviance associated with the product.

Design for behavioral change

The focus was put to increase a motivation by using following principles: sense of belonging, framing, loss aversion, social validation, and more.

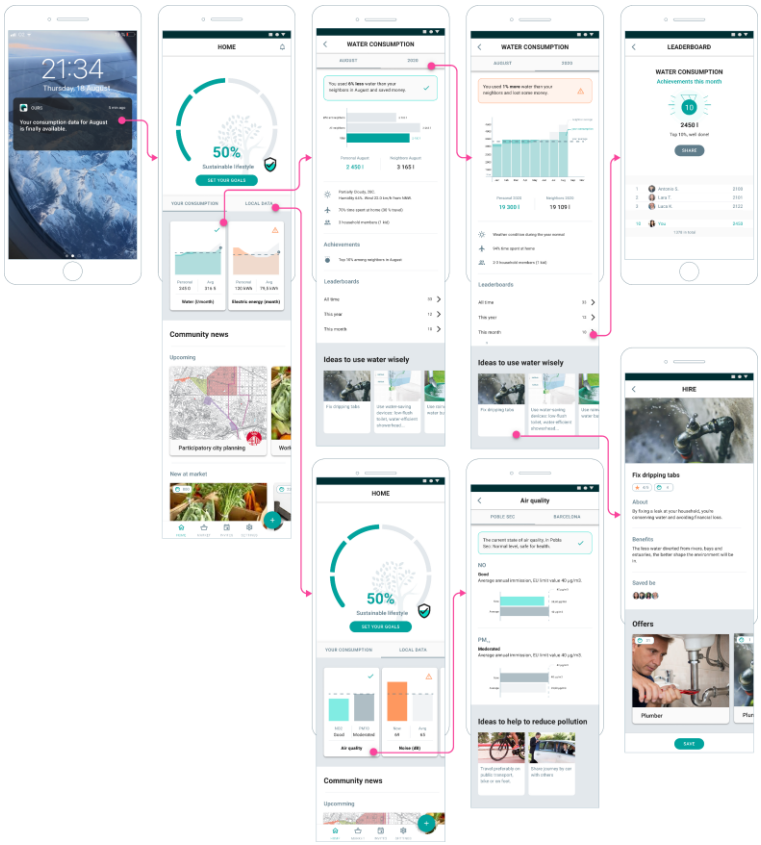

Figure 21: Mock-ups in flow: Information access (available in ANNEX: 10)

3.4 Conclusion

A sustainable lifestyle is the broad and long-term goal of people. Thus, it is insufficient in supporting motivation for behaviors and clear enough instructions on how to behave. Mobile application **OURS** tries to answer these issues by dividing a sustainable lifestyle into smaller portions, aspirations that are selected by the user him/herself when creating a profile in the app. For each set of aspirations, the application support user with ideas for behaviors, as well as provides access to related services and information as the core product strategy is service-dominant product. This approach helps users to do the behavior(s) which he/she can do now and having an effect in the future. In other words, as a result, the application helps to increase the occurrence of behaviors towards the long-term goals of a sustainable lifestyle.

Usage of omnipresent smart-phone technology and data from a variety of sources (public data, IoT, users' data from other apps) to initiate behavioral change in a global scale allows fast adaptation of behaviors towards a sustainable lifestyle. On the other hand, the activities supported by the application occur within a neighborhood. That makes the actions more tangible. Additionally, the application contributes to building connected society with relationships among neighbors.

While the user experience and user interface design of the product is strongly based on the literature review of a sustainable lifestyle and behavioral change design, the strategy of the product is based on providing the access to services and information leading towards circular economy.

CONCLUSION

Due to a literature review of recent publications, this research achieved a deep understanding of what areas of life contribute to a sustainable lifestyle, these areas are food, housing, mobility, consumption, and leisure. Moreover, it helped to identify a list of specific behaviors that support a sustainable lifestyle. The division of areas and the list of behaviors was directly used in the practical part of the thesis and design solution of the product.

Furthermore, the extensive investigation related to behavioral change design, models, and design strategies enabled the selection of the most suitable behavioral model for the digital product development process, Fogg behavioral model. After consideration, the model was translated to the user interface in the context of a sustainable lifestyle and become an integrated part of the mobile application that was designed as a solution for the proposed hypothesis of the thesis. Through this integration, the application obtained a high degree of personalization that is necessary for successful behavioral change, because a behavioral product can be successful only if it helps people change their behavior to the extent that they care about.

The literature research also influenced the selection of the product strategy and technology, that is a service-dominant product mediated by smartphone. It aims to change the behaviors of individuals within the community of neighbors by improving access to local information and services.

The result of the design is the mobile application called OURs with user interface design and branding that uses a variety of behavioral techniques to achieve desired behavioral change of individuals towards sustainable lifestyle.

The success of the behavioral change wasn´t measured due to simple issues, to measure the impact of the product on behavioral change is possible only if the product is used in real-life situations, that was not possible during this master thesis. Nevertheless, the contribution of this project is a new perspective on how to deal with future development towards sustainability via smartphone and mobile application and change in behaviors of millions of users around the world. Moreover, even though the product is based on technology, it highly depends on social connections and thus meets human needs for socializing.

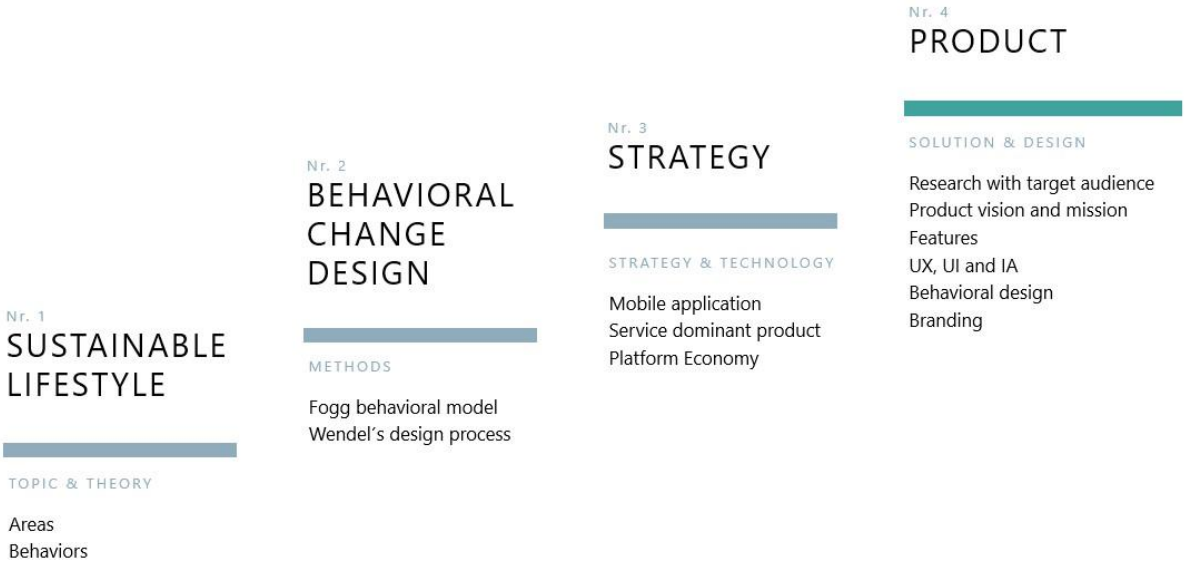

Figure 22: Stages of product creation

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ANNEXES

1. Table of Aspirations and behaviors divided by Areas of Sustainable lifestyle

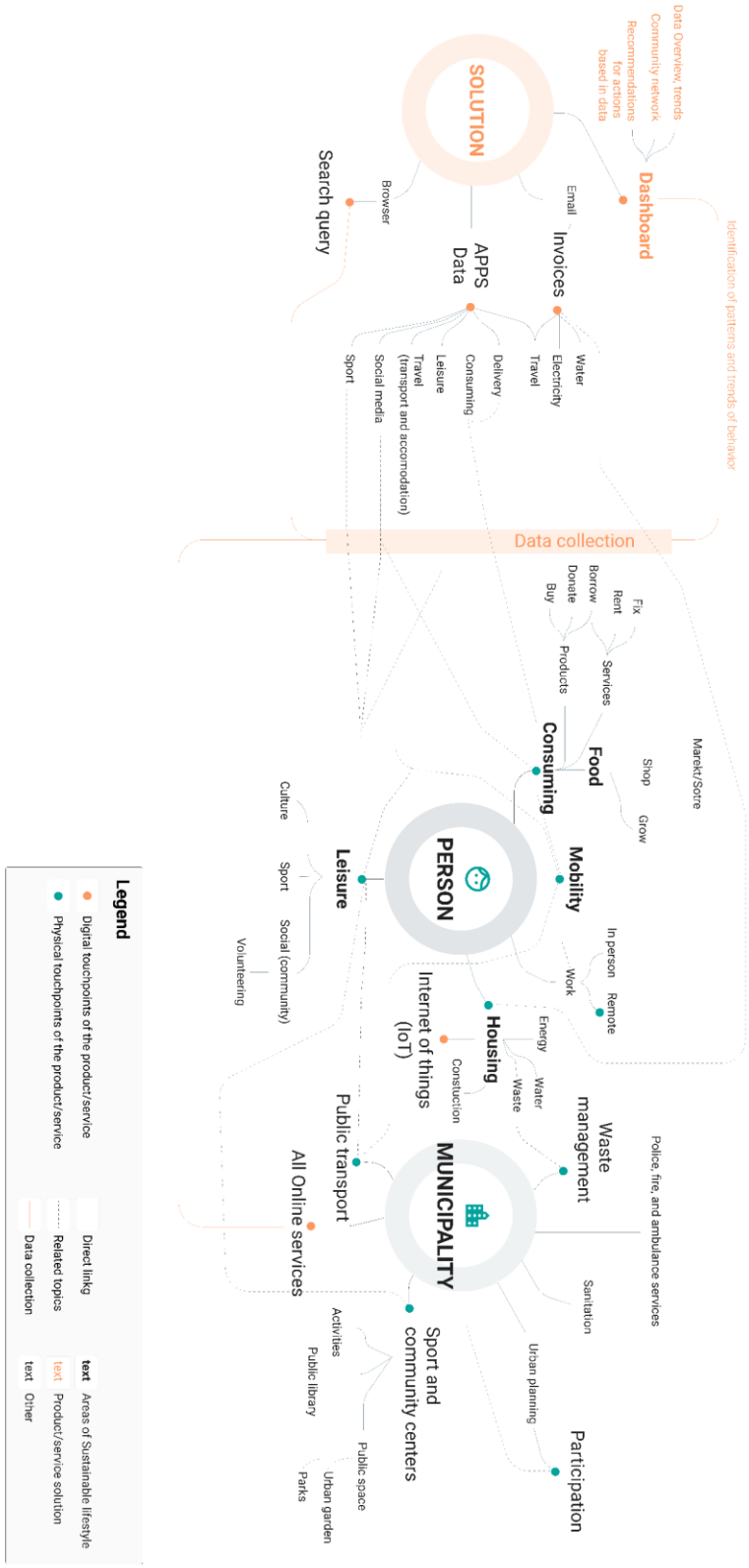
Note: the format of the table was changed for better readability

AREA	ASPIRATION	BEHAVRIOS
FOOD	I want to cook and/or manage a healthier diet	• Choose local, fresh, in-season, and/or organic products. • Increase the proportion of vegetables, fruit, and grains in the diet. • Decrease or eliminate consumption of animal products (particularly red meat).
	I want to lead a vegan lifestyle	• Eat necessary minerals and vitamins. • Increase the proportion of vegetables, fruit, and grains in the diet. • Decrease or eliminate consumption of animal products (particularly red meat).
	I want to waste less food	• Sort for quality and safety. • Join urban garden. • Plan meals ahead. • Distinguish best before and use by dates. • Buy only what you need. • Reuse leftovers. • Cook in community. • Donate extra food.
	I want to grow own food	• Grow your herbs • Join urban garden • Grow your vegetables
HOUSING	I want to use energy wisely	• Install/top-up loft insulation or cavity/solid wall insulation or double glazing • Upgrade heating and hot water systems (boiler). • Generate own energy by installing renewables (Wind, solar/electric, collar/water, micro-CHP, ground, and air source heat pumps) • Manage temperature and adjust thermostats to recommended temperatures (20-21ºC in winter and 25-26ºC in summer). • Wash & dry laundry using minimum energy & water programs (Line drying laundry, switching to green energy tariff, washing clothes less often or at lower temperatures). • Unplug device when not in use. • Use pressure cookers and steam cookers to reduce cooking time. • Using eco-labeled and energy-efficient appliances.
	I want to use water wisely	• Use water-saving devices (low-flush toilet, water-efficient showerhead). • Upgrade heating and hot water systems (boiler) • Fix dripping taps.

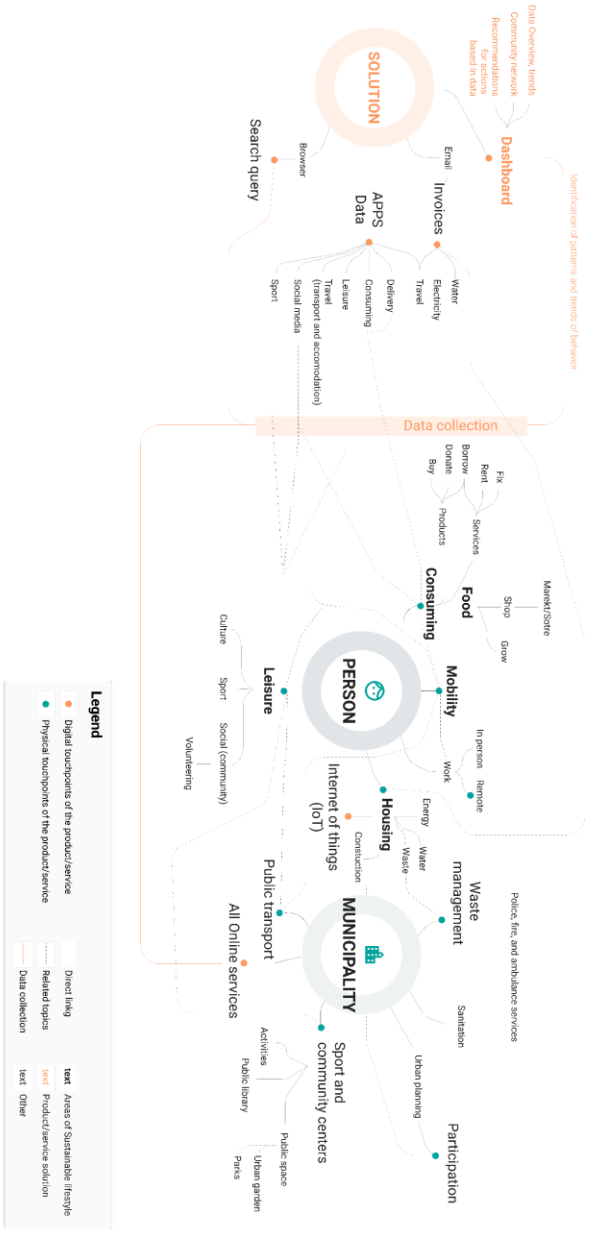
		• Use rainwater and a water butt. • Wash your clothes with cold or lukewarm water. • Take a shower instead of a bath and remember to turn off the tap when soaping yourself and brushing your teeth. • Wash & dry laundry using minimum energy & water programs (Line drying laundry, switching to green energy tariff, washing clothes less often or at lower temperatures).
	I want to compost bio-waste	• Home composting garden waste. • Using peat-free compost. • Home composting food waste.
	I want to use less chemicals	• Use natural cleaners. • Use the right amount of detergent. • Ditch the air-conditioner and buy an aspidistra; plants help cut pollution.
	I want to create less waste	• Recycle plastics. • Recycle paper. • Use reusable glass bottles and avoid plastics. • When shopping, use reusable bags and avoid products wrapped or packaged in plastic. • Avoid using wet wipes and paper wipes. If you do use them, do not throw them down the toilet. • Curtail junk mail. • Cancel paper statements and start using e-tickets. • Bring your own bags to the market.
MOBILITY	I want to use sustainable means of transport	• Cycling. • Walking. • Using public transport. • Share the car with other people whenever you have the chance to do so. • Whenever possible, use the vehicle that pollutes the least. • Check your tire pressure to make sure it is not low, which will increase your fuel consumption and thus CO2 emissions. • Whenever possible, use the vehicle that pollutes the least. • Combine public transport with cycling to cover longer distances, if necessary.
	I want to buy or replace a vehicle for eco-friendly option	• Buy lower-emission models. • Use electric vehicles.
	I want to decrease my travel to work	• Work from home. • Use video conferencing.
	I want to travel long journeys eco-friendly	• Use lower-carbon alternatives – trains. • Combining trips while using more sustainable travel options.

CONSUMPTION	I want to use eco-products and services	• Use labeling to choose most energy and water-efficient products • Choosing fairly traded, eco la-belled, and independently certified food, clothing. • Avoid private car use, single-occupancy driving. • Avoid one-time use products such as plastics. • Purchase fair-trade, cruelty-free and eco-friendly product. • Buy fewer bottles.
	I want to borrow or hire products or services	• Borrow or hire electrical goods. • Use local hire/share & swap schemes for tools etc. • Compare energy use within the community. • Join a tool library or rarely used household tools and appliances. • Rent less-frequently used products instead of buying.
	I want to use second-hand or recycled products	• Choose 2nd hand furniture and clothing.
	I want to own and give high quality goods and/or services	• Use tailored clothes and goods. • Give experience presents instead of goods. • Use rechargeable batteries.
	I want to practice minimalism	• Avoid unnecessary products promotions and discounts.
	I want to repair, recycle or donate goods	• Repair broken products. • Give away/donate old but still usable items. • Install an add block.
LEISUIRE	I want to use community resources	• Swap skills. • Use local shops. • Work with the community to grow food Sharing knowledge and skills. • Join and use the library.
	I want to use outdoor spaces	• Use your local green spaces. • Buy your own hive.
	I want to be improving the environment	• Volunteering with a local or national group. • Participate in local decisions and urban planning.
	I want to avoid tourism to sensitive biodiversity hotspots	• Choose low impact activities such as eco-tourism.

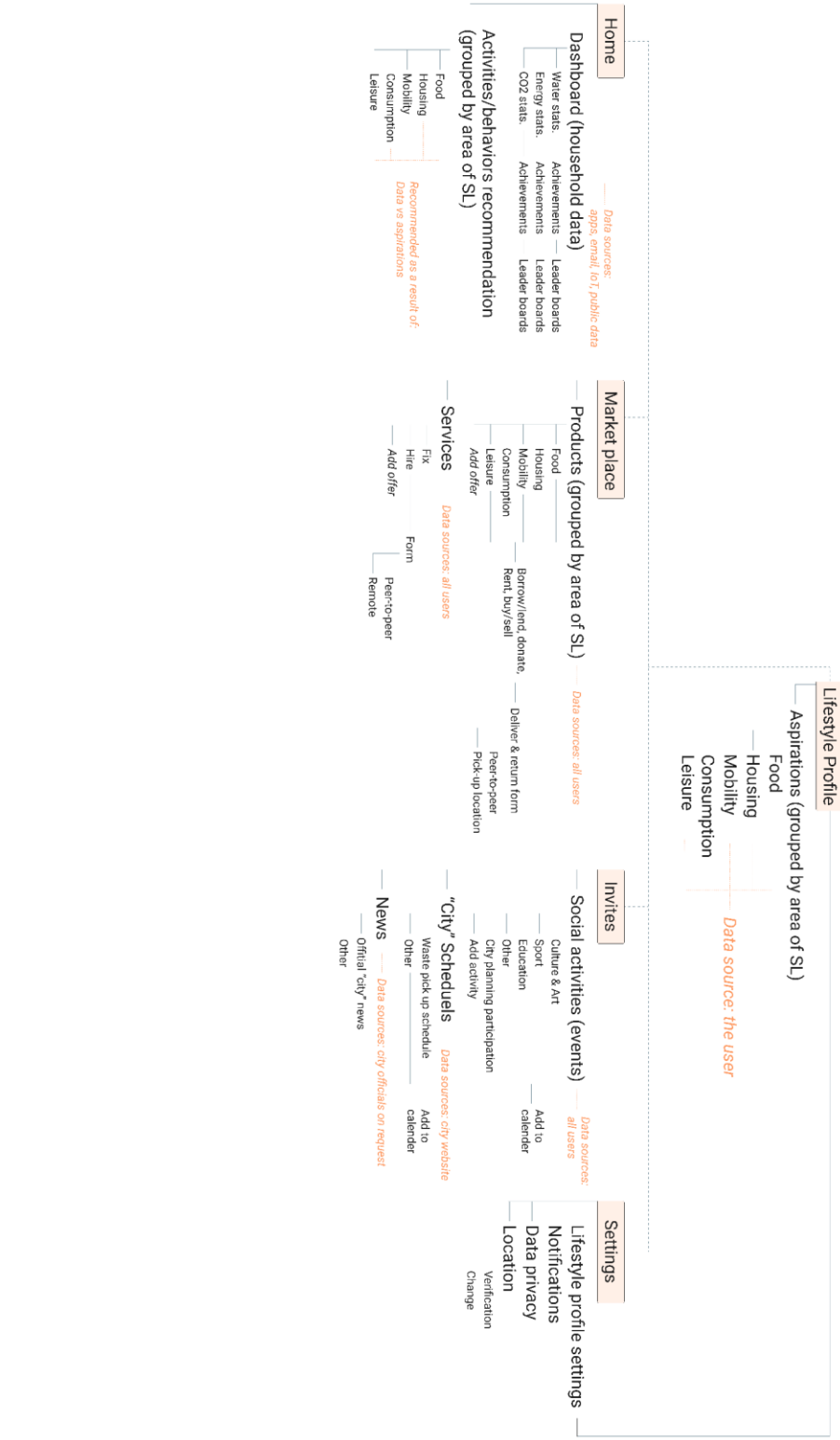
2. 3. MIND MAP


Data Overview, trends
Community network
Recommendations for actions based in data
Dashboard
SOLUTION
Email
Browser
Search query
Invoices
APPS Data
Water
Electricity
Travel
Delivery
Consuming
Leisure
Travel (transport and accomodation)
Social media
Sport
Identification of patterns and trends of behavior
Data collection
Buy
Donate
Borrow
Rent
Fix
Products
Services
Consuming
Food
Shop
Grow
Market/Store
PERSON
Mobility
In person
Remote
Work
Housing
Energy
Water
Waste
Constuction
Internet of things (IoT)
Leisure
Culture
Sport
Social (community)
Volunteering
Public transport
All Online services
MUNICIPALITY
Waste management
Police, fire, and ambulance services
Sanitation
Urban planning
Participation
Sport and community centers
Activities
Public library
Public space
Urban garden
Parks
Legend
Digital touchpoints of the product/service
Physical touchpoints of the product/service
Direct linkg
Related topics
Data collection
Areas of Sustainable lifestyle
Product/service solution
Other

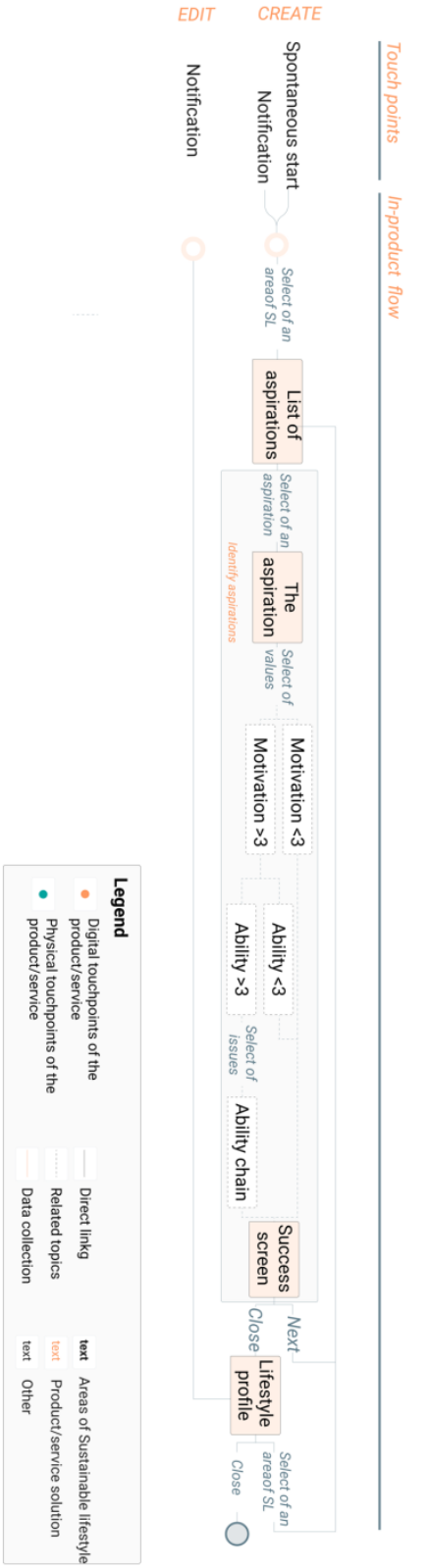
3.


Data Overview, trends
Community network
Recommendations for actions based in data
Dashboard
SOLUTION
Email
Invoices
Water
Electricity
Travel
Search query
Browser
APPS Data
Delivery
Consuming
Leisure
Travel (transport and accomodation)
Social media
Sport
Identification of patterns and trends of behavior
Data collection
Buy
Donate
Borrow
Rent
Fix
Products
Services
Consuming
Food
Shop
Grow
Market/Store
PERSON
Mobility
In person
Remote
Work
Housing
Energy
Water
Waste
Construction
Internet of things (IoT)
Leisure
Culture
Sport
Social (community)
Volunteering
Public transport
All Online services
Waste management
Police, fire, and ambulance services
MUNICIPALITY
Sanitation
Urban planning
Participation
Sport and community centers
Activities
Public library
Public space
Urban garden
Parks
Legend
Digital touchpoints of the product/service
Physical touchpoints of the product/service
Direct linkg
Related topics
Data collection
text
Areas of Sustainable lifestyle
text
Product/service solution
text
Other

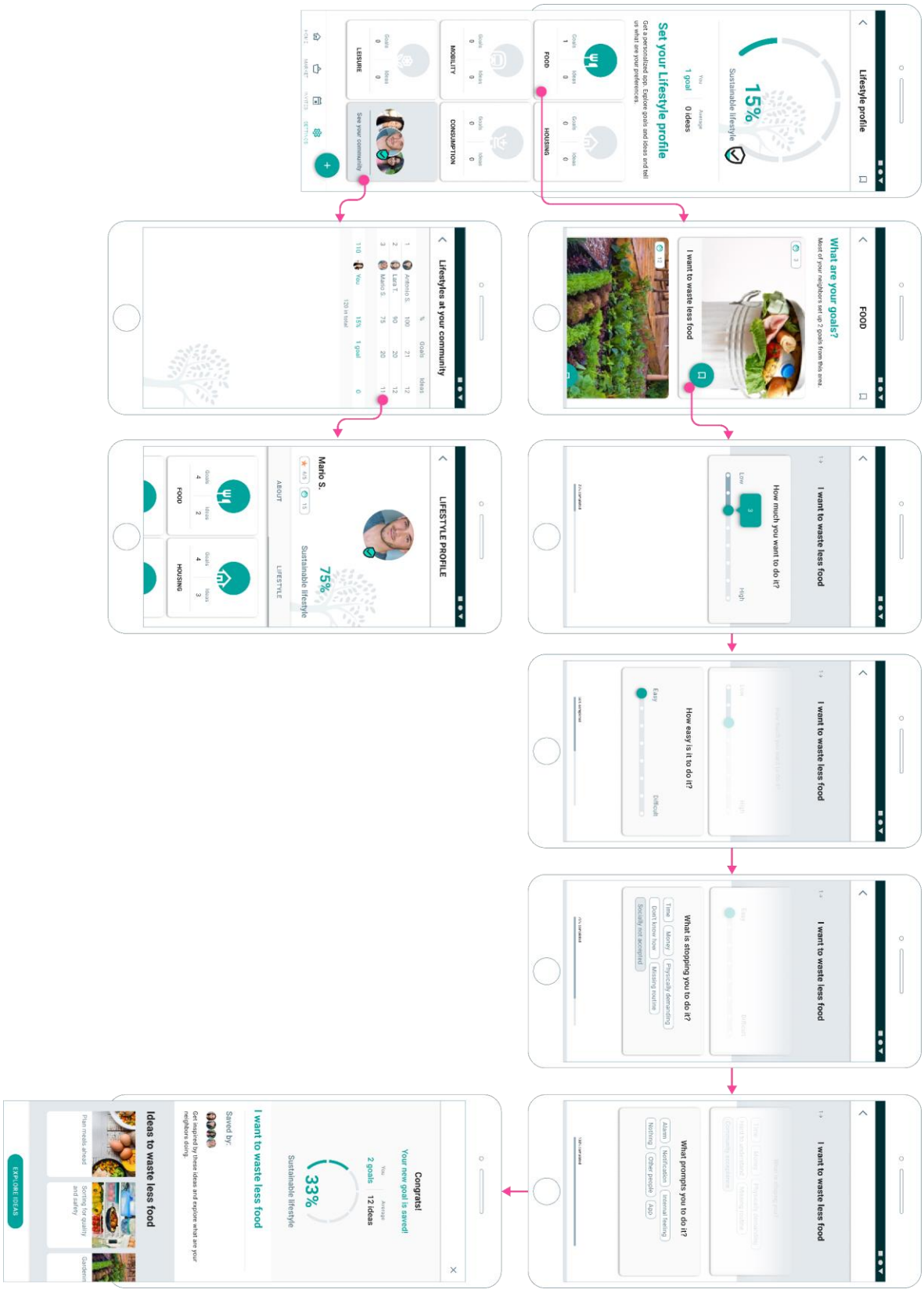
4. INFORMATION ARCHITECTURE OF THE APP OURS



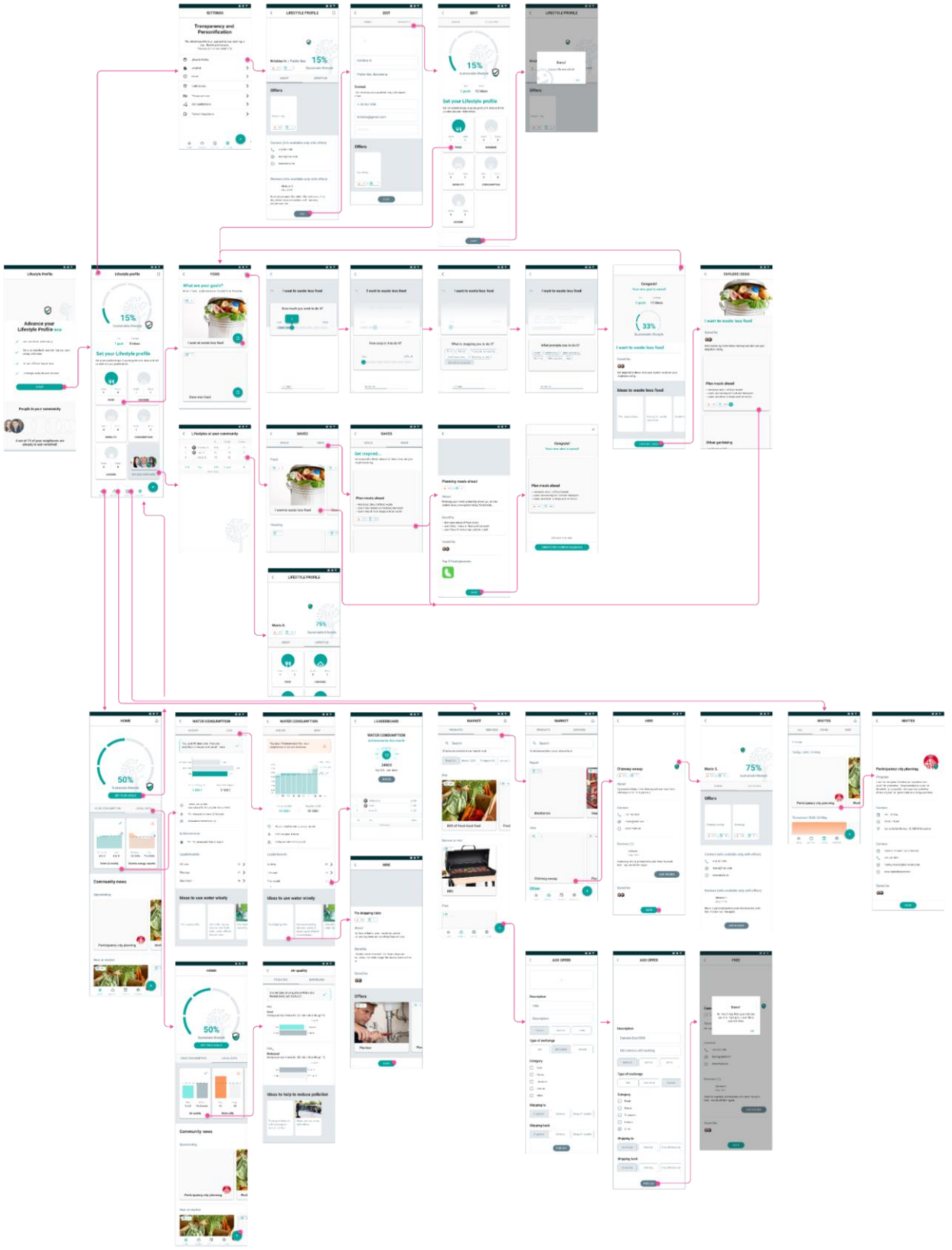
4. SELECTED USER FLOW: LIFESTYLE PROFILE



5. SELECTED MOCK-UPS: LIFESTYLE PROFILE

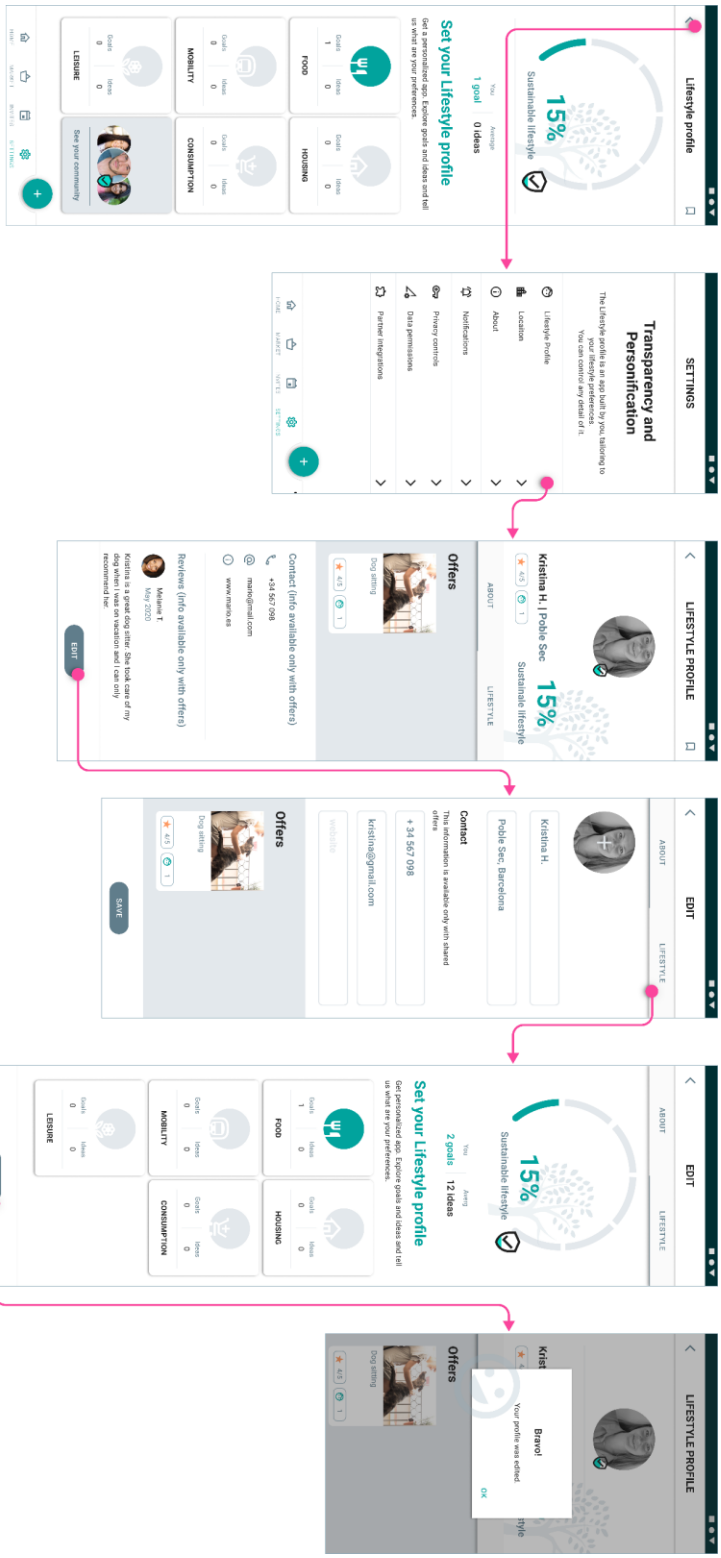


6. FULL APP MAP

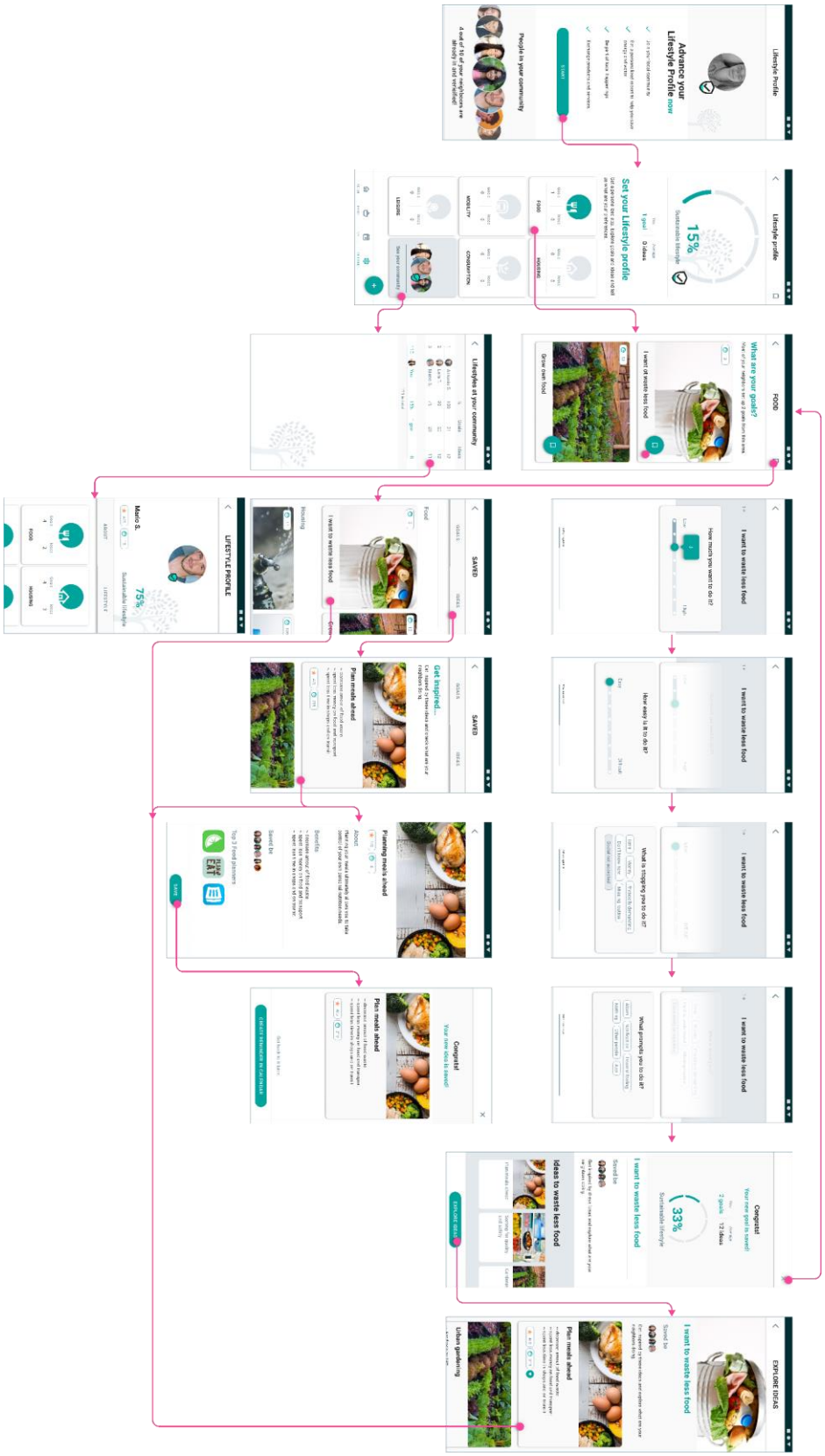


Note: Following screens show the map divided to flows to ensure visibility of the design

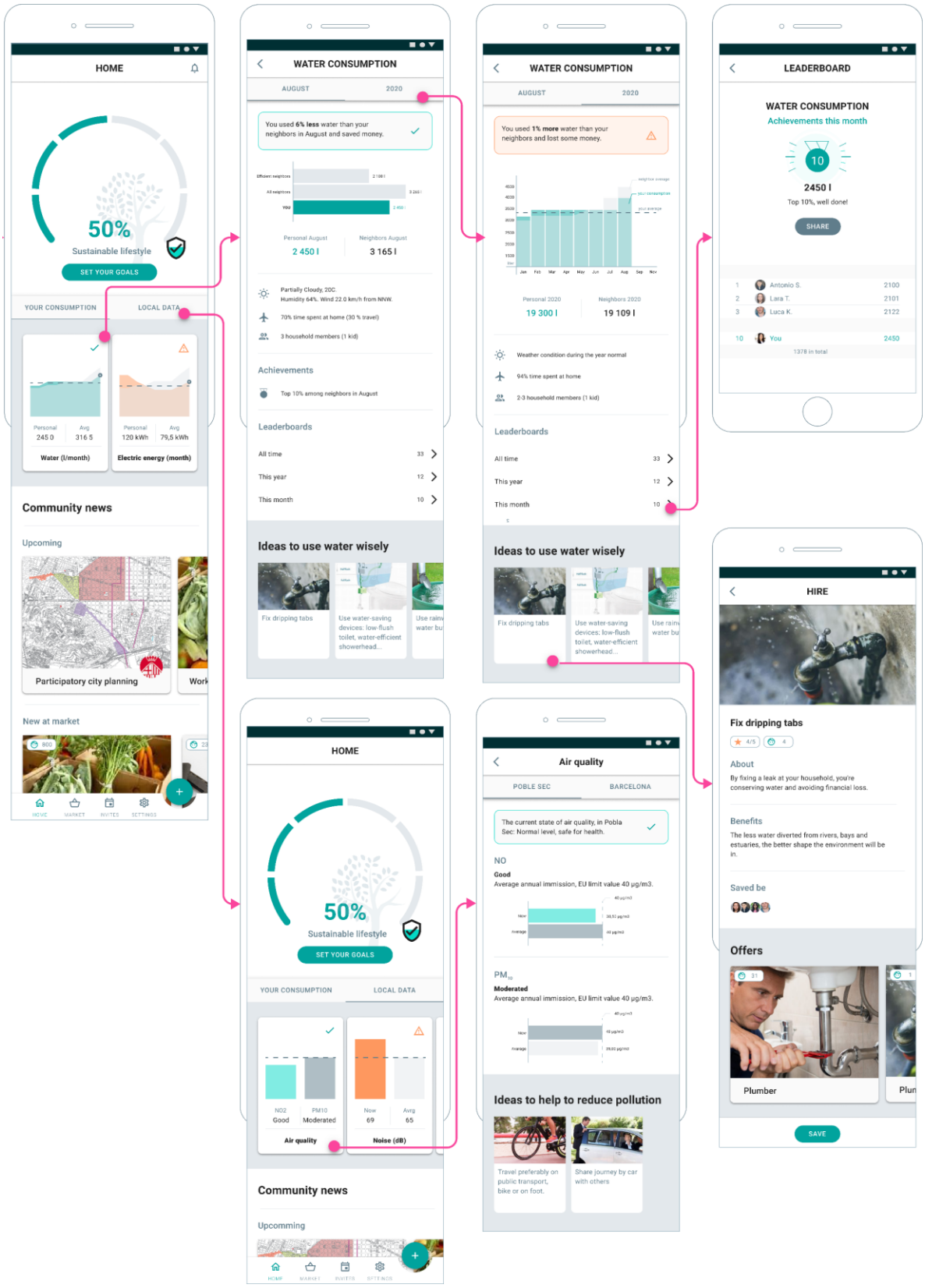
EDIT PROFILE



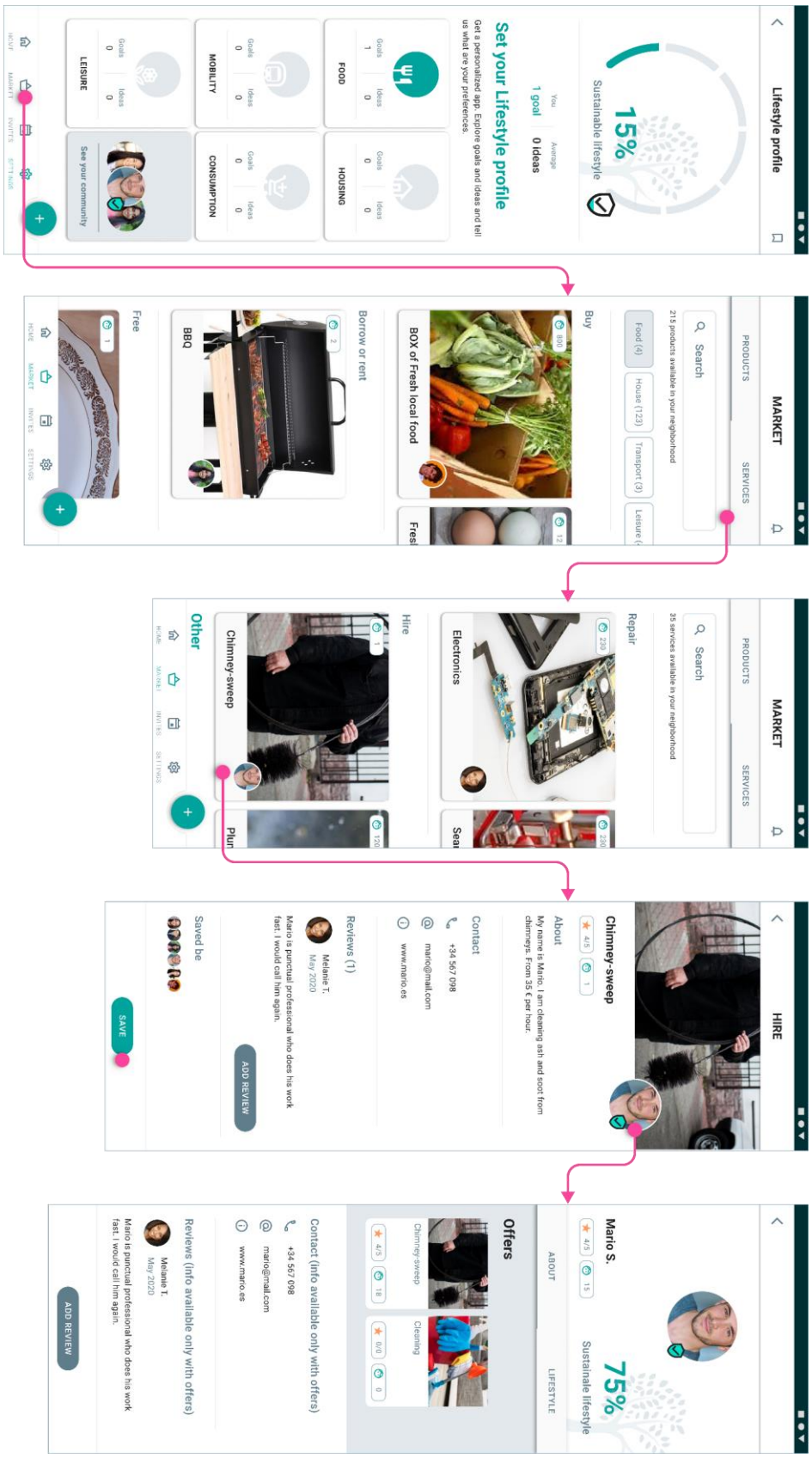
CREATE LIFESTYLE PROFILE



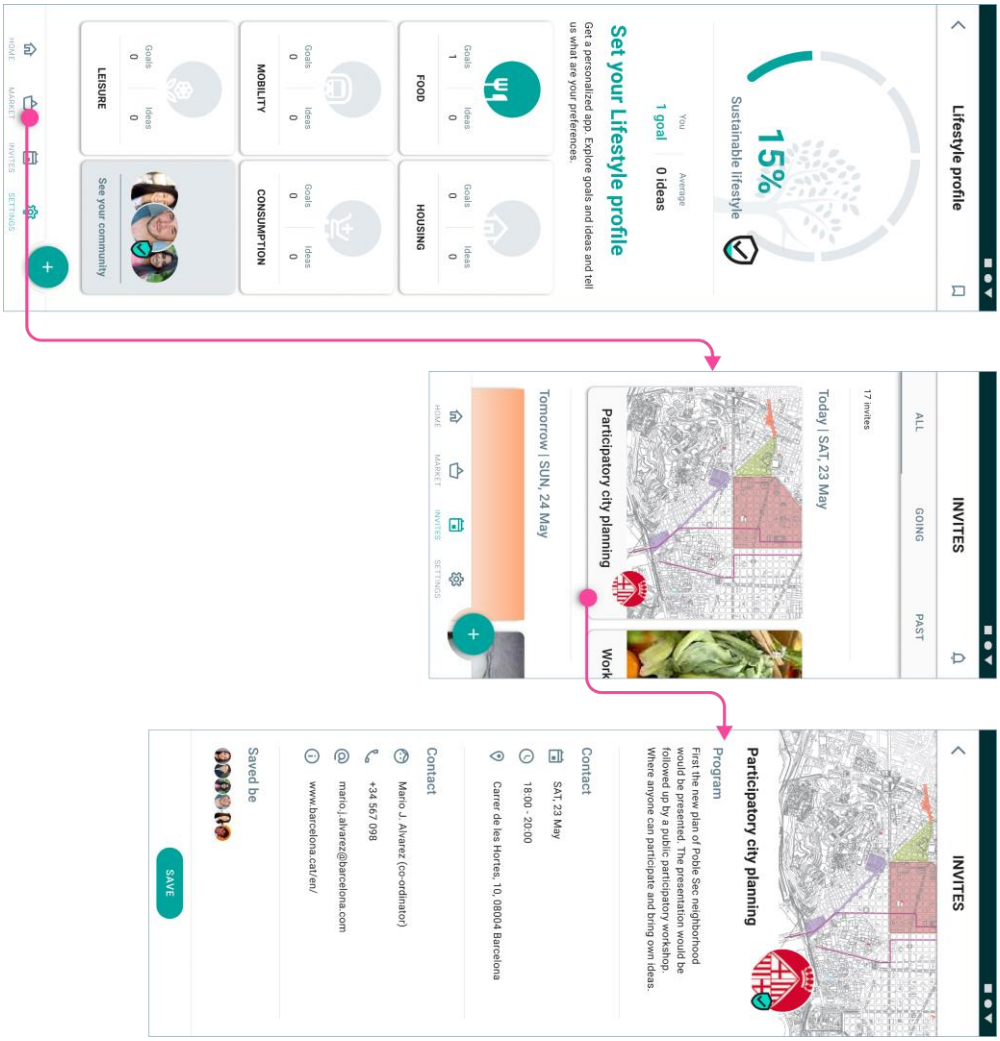
VIEW DASHBOARDS



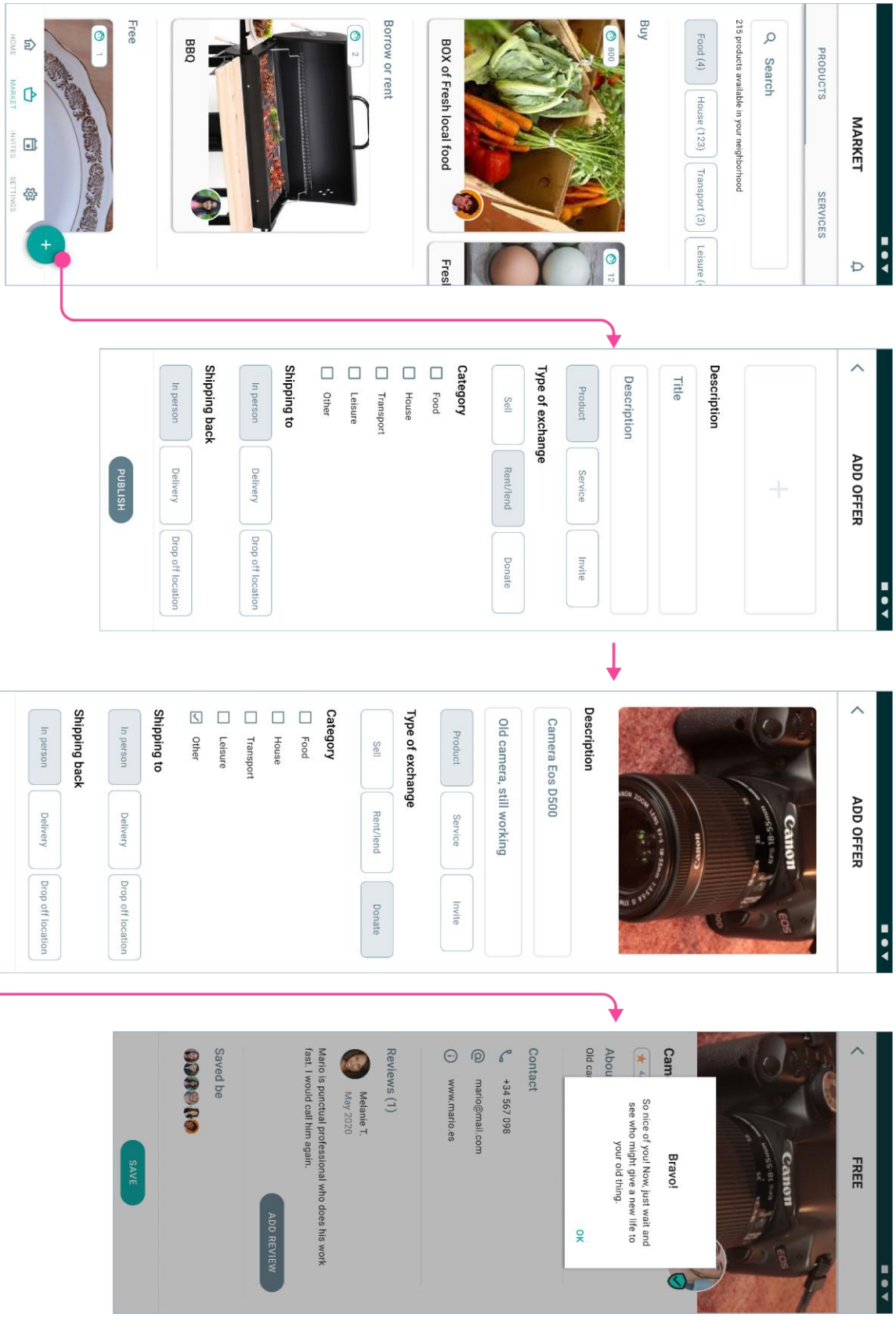
VIEW MARKET


Lifestyle profile
15%
Sustainable lifestyle
You
1 goal
Average
0 ideas
Set your Lifestyle profile
Get a personalized app. Explore goals and ideas and tell us what are your preferences.
FOOD
HOUSING
MOBILITY
CONSUMPTION
LEISURE
See your community
MARKET
PRODUCTS
SERVICES
Search
215 products available in your neighborhood
Food (4)
House (123)
Transport (3)
Buy
BOX of Fresh local food
Borrow or rent
BBQ
Free
35 services available in your neighborhood
Repair
Electronics
Hire
Chimney-sweep
Other
HIRE
Chimney-sweep
4/5
Contact
+34 567 098
mario@mail.com
www.mario.es
About
My name is Mario. I am cleaning ash and soot from chimneys. From 35 € per hour.
Reviews (1)
Melanie T.
May 2020
Mario is punctual professional who does his work fast. I would call him again.
ADD REVIEW
Saved be
SAVE
Mario S.
Sustainable lifestyle
75%
ABOUT
LIFESTYLE
Offers
Chimney-sweep
Cleaning
Contact (info available only with offers)
Reviews (info available only with offers)

VIEW INVITES



ADD OFFER


MARKET
PRODUCTS
SERVICES
Search
215 products available in your neighborhood
Food (4)
House (123)
Transport (3)
Buy
BOX of Fresh local food
Borrow or rent
BBQ
Free
HOME
MARKET
INVITES
SETTINGS
ADD OFFER
Description
Title
Description
Product
Service
Invite
Type of exchange
Sell
Rent/lend
Donate
Category
Food
House
Transport
Leisure
Other
Shipping to
In person
Delivery
Drop off location
Shipping back
PUBLISH
Camera Eos D500
Old camera, still working
FREE
Bravo!
So nice of you! Now, just wait and see who might give a new life to your old thing.
OK
Contact
+34 567 098
mario@mail.com
www.mario.es
Reviews (1)
Melanie T.
May 2020
Mario is punctual professional who does his work fast. I would call him again.
ADD REVIEW
Saved be
SAVE

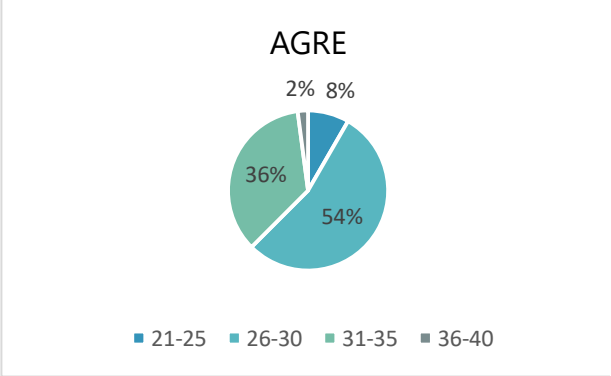
7. RESULTS OF RESEARCH: SURVEY

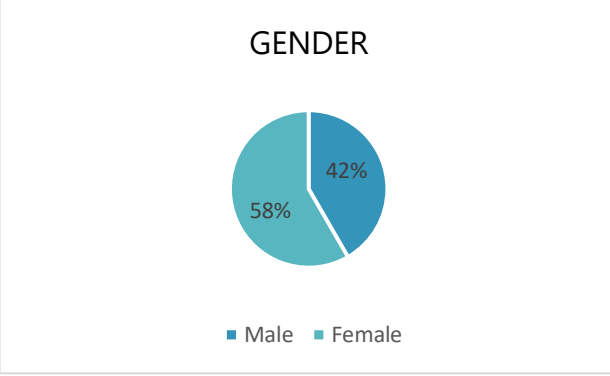
The survey was conducted during April 2020, using Google Forms application to collect data and Microsoft Excel for analyzing the data. In total, 58 people participated, but 8 were due to the not meeting criteria of the target audience discarded and they are not reflected in the result below. The goal of the research was to identify the most common aspirations among the target audience.

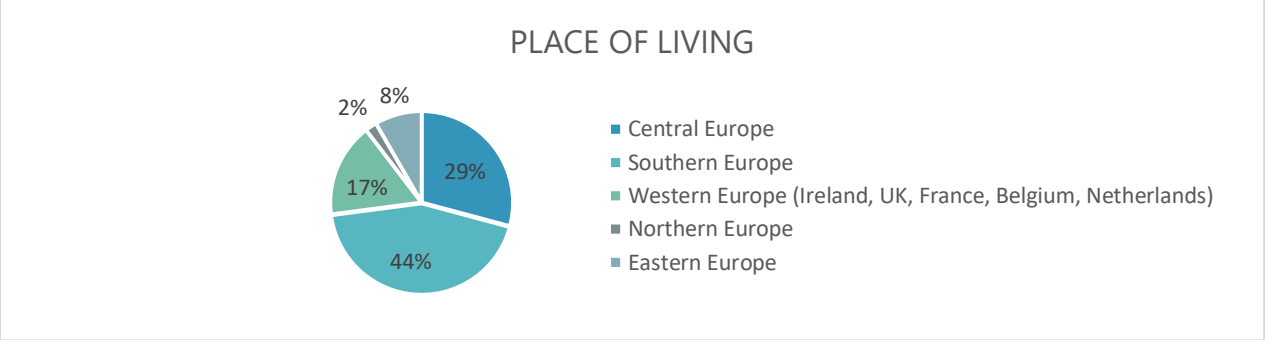
The survey was divided to 6 parts:

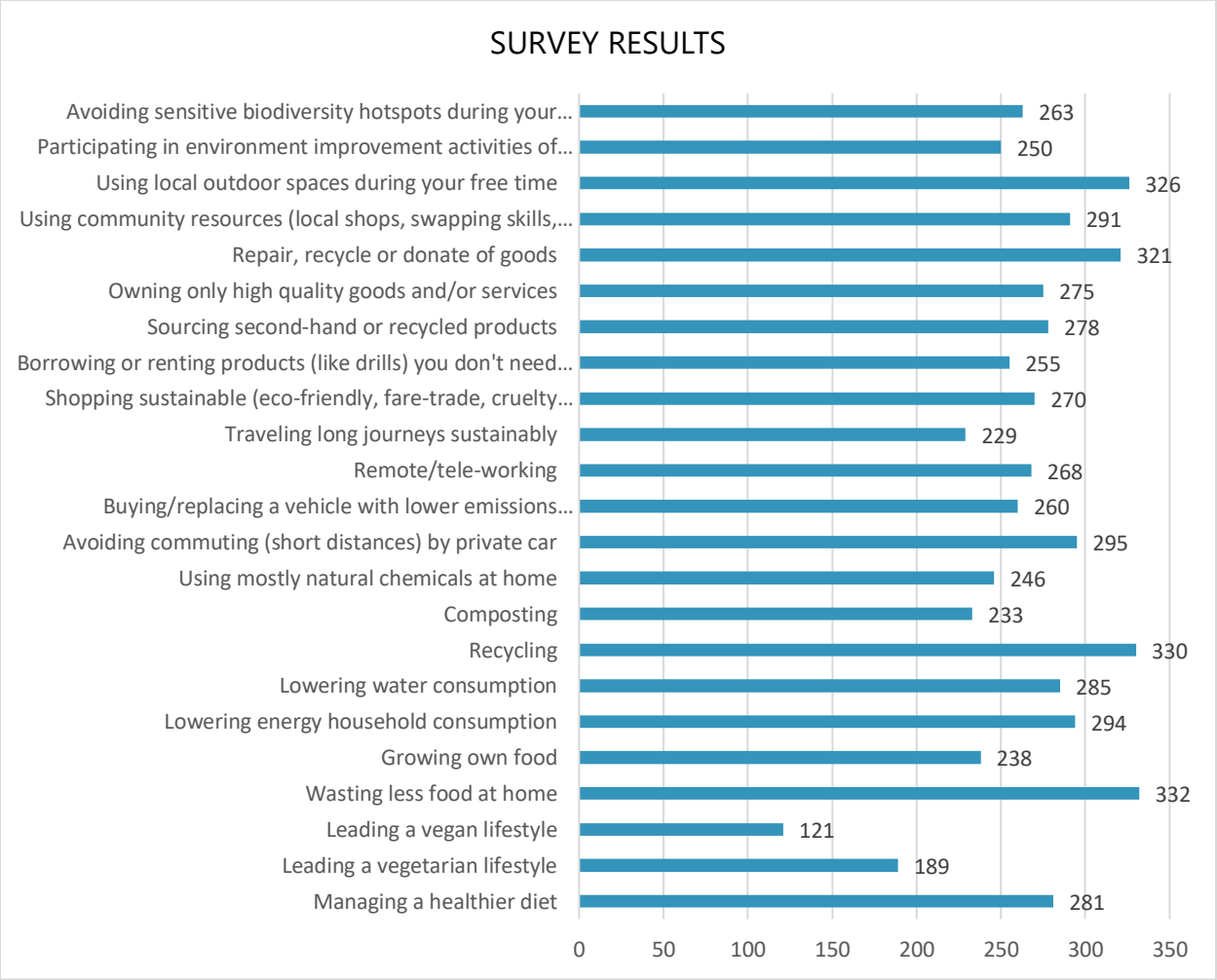
- Demography (age, gender, place of living)
- Areas of the sustainable lifestyle:
    - Food
    - Housing
    - Mobility
    - Consumption
    - Leisure

Participants were asked to evaluate the level of motivation form from 1 to 8 for a list of aspirations that were identified during the literature review. The scale was based on Fogg behavioral model that uses the same values for element of motivation. The values were counted together.









Following table illustrates results, the highest values of motivation per area of sustainable lifestyle:

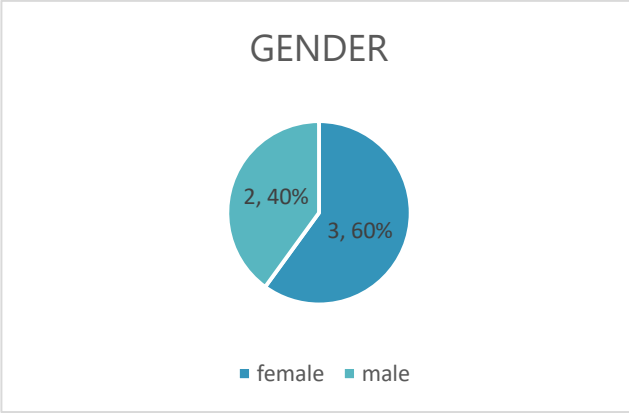
Food	Wasting less food at home	332
Housing	Recycling	330
Mobility	Avoiding commuting (short distances) by private car	295
Consumption	Repair, recycle or donate of goods	321
Leisure	Using local outdoor spaces during your free time	326

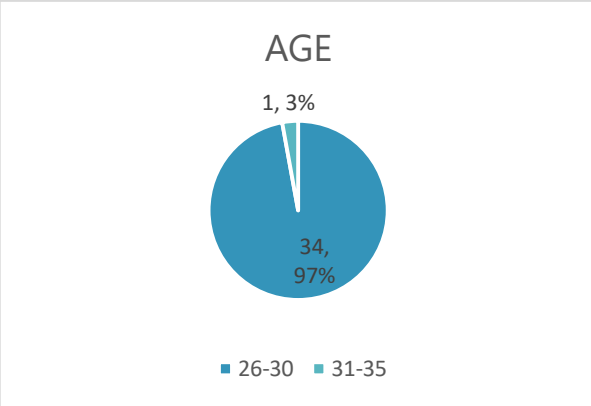
8. RESULTS OF RESEARCH: INTERVIEWS

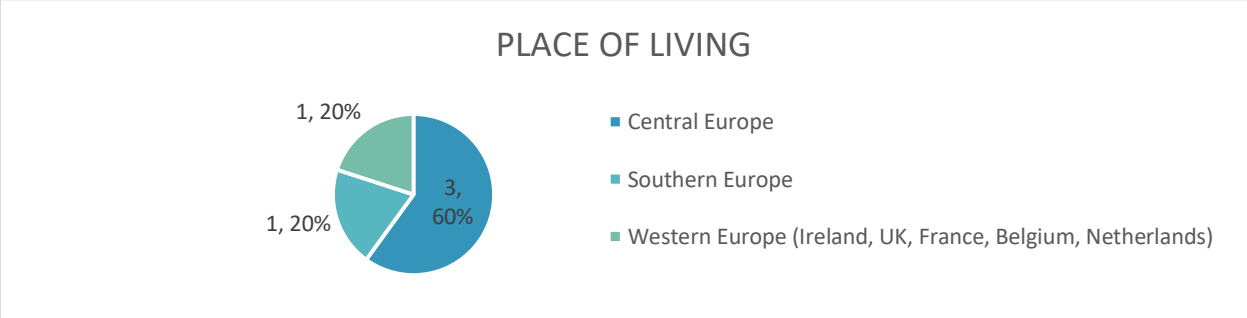
The interviews via remote video call were conducted during April 2020, using Messenger application. In total, 5 people from target audience participated. The goal was to understand user needs for sustainable lifestyle. The collected responses were noted to notebook and later rewritten to this document.

The survey was divided to 3 parts:

- Demography (age, gender, place of living)
- Introduction with the only question: *Why do you think is sustainable lifestyle important?*
- 5 Whys technique, to identify the root cause of the fundamental-emotional human need or instinct.







Additionally, 3 out of 5 respondents were childless. Those who have kid(s) mentioned it at some point during the interview as a form of motivation for sustainable behavior.

Conclusions after 5th Why were following:

Respondent 1: *"I am a person who is thinking about the future. I don´t want us to be the last generation on this planet. I believe it´s an instinct, probably my maternal instinct."*

Respondent 2: *"It is changing so fast, that it´s not anymore about next generation but about people we love and us. I want to live in future with the same quality of averment if not better."*

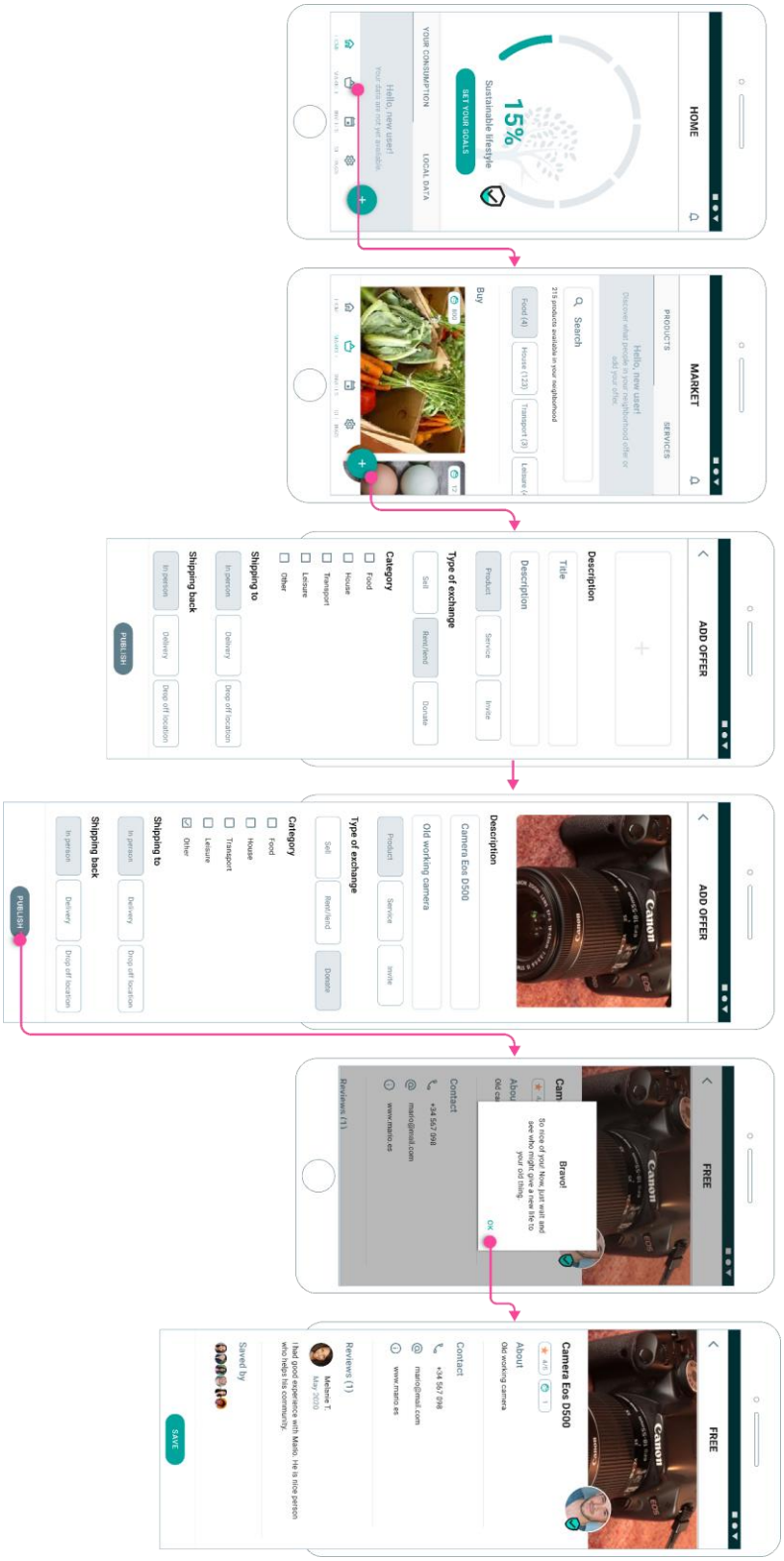
Respondent 3: *"It brings me good feeling to behave in the right way, to contribute to better future. It´s also challenging to do things right and I like to be challenged."*

Respondent 4: *"It is in our DNA to keep species running."*

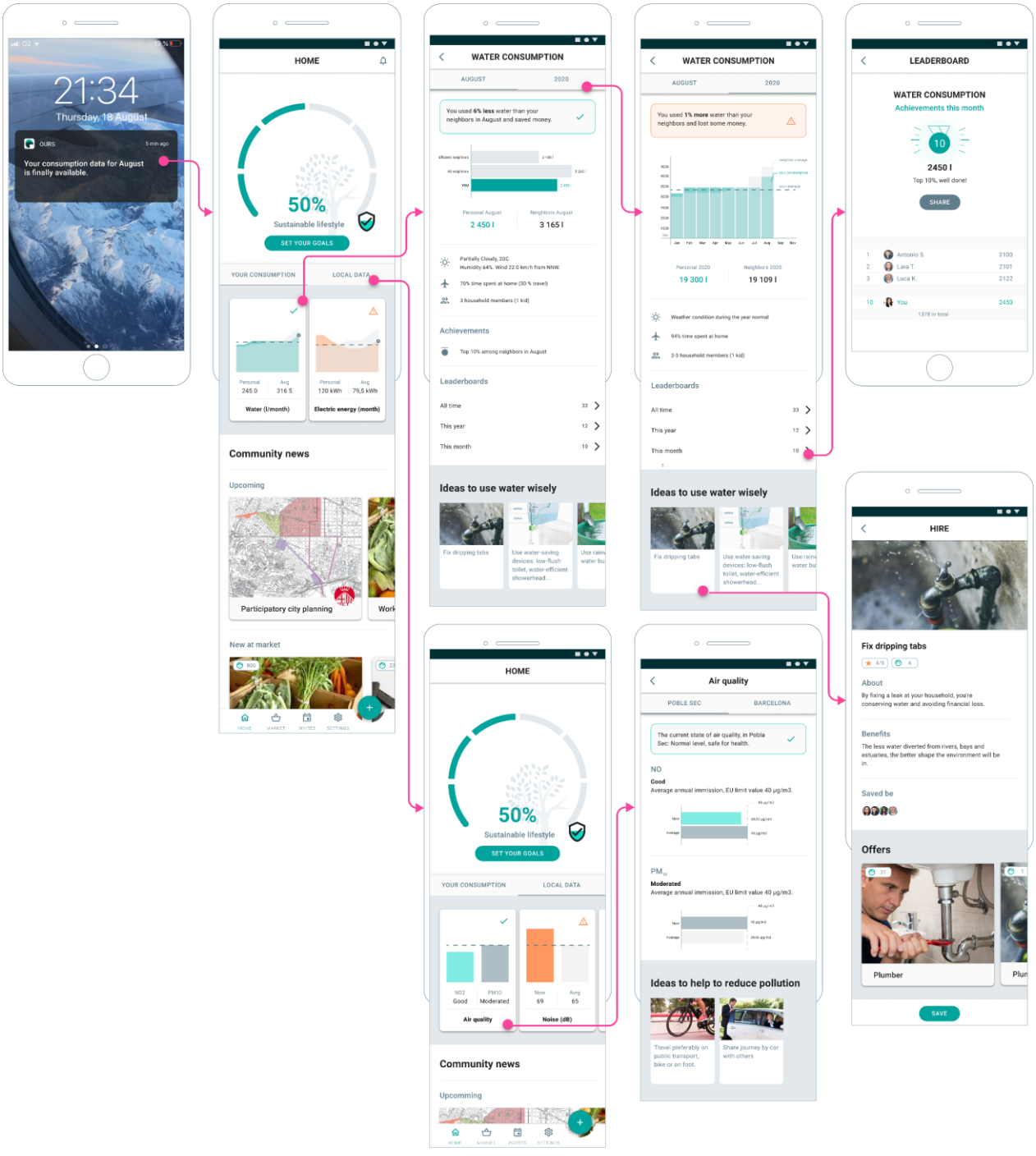
Respondent 5: "We have only one planet and thus we need to behave sustainably. It is important for my kids, to give them world that they can enjoy not only work on solving problems."

The research helped in forming long term user goal for designed application OURS: *To live in a way that provide for future myself and next generations (people I love) quality of life equal or better than the current one.*

9. MOCK-UPS IN FLOW: ACCESS TO SERVICE FLOW



10. MOCK-UPS IN FLOS: ACCESS TO INFOMRAITON FLOW



THE END